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A McCormick International BWD-6 tractor and B-23 mower cutting Napier grass in East Africa for mulching coffee

World Dominated By Insects?

A number of authors with a very broad sense of imagination say that we are approaching the Insect Age. They paint our future in colours that are far from pleasant, and visualize the human race overrun by well-organized insect states. But in passing off such stories as fables, one is nevertheless caused to ponder.

Today, and not in the distant future, almost incredible losses are suffered throughout the world as a result of crop destruction by members of the insect world. To quote but one example – in the U.S.A., annual losses of agricultural produce inflicted by insect pests and plant diseases are estimated at three thousand million dollars. And a by no means inconsiderable percentage of these losses is attributed to the activities of insects.

What measures does the human race take to counteract this damage? Highly qualified scientists and technicians pit their brains against the wiles of the insects. A great contribution to this task is made by research workers of Farbenfabriken Bayer, Leverkusen, led by Dr. Gerhard Schrader the discoverer of Parathion. It is to his research team that the world owes such extremely effective crop protection products as the systemic insecticides Omp[illegible] (Schradan), Systox and Metasystox, and the insecticides HETP, TEPP, Sulfotep, Methylparathion, Chlorthion, [illegible]terex and Gusathion.

FARBENFABRIKEN BAYER AG LEVERKUSEN / GERMANY

Agencies in all countries of the world.

Editorial Comment

Keeping an eye on steel

GROWERS OF COFFEE in Uganda, sugar in Mauritius or copra in Fiji may well express surprise to find their attention directed, not towards mechanisation problems, pest control methods or fertilisation procedures, but to be requested to observe instead the recent performance of Britain's steel industry.

For, whilst they may possibly be vaguely sorry to learn that steel production is in the doldrums, they will refuse to shed too many tears over what is, after all, the common lot of Economic Man. There is nothing unique in economic history about redundancy, destocking and inventory shortening – except, possibly, the new-fangled terms now used to describe old-fashioned phenomena.

Yet the coffee man, the sugar planter and the grower of coconuts are facing much the same problems, but, being without benefit of technical jargon, they probably content themselves by remarking that ' The bottom has somehow dropped out of the market '.

Yet there is a connection between the steelmen in Sheffield and South Wales, whose magnificent and costly new capital equipment is running below capacity, and the primary crop producer, who is wondering whether he might not just as well put a match to his crop in default of finding a buyer. By and large, the primary producer markets his crop in the industrialised countries and when they suffer a slump (or ' recession ' under the new dispensation) one of the casualties of falling purchasing power is the primary producer of foodstuffs and industrial raw materials.

It is never easy to decide just when a recession starts or how its progress is developing, but the figures of steel output are generally agreed to be one of the most reliable indicators of the economic health of the world.

Nor, for that matter, can one be quite sure which comes first. Does the falling income of the primary-producing country lead to lower imports of finished goods, such as motor cars, and consequent recession in the industrialised countries? Or, on the other hand, does reduced activity in the industrialised countries result in lowered living standards there and a declining demand for primary imports from the tropics ?

Whatever the answer to this economic ' Whodunit ', the steel industry provides the essential clue, both to the arrival of a recession and also its impending end. Just as the reader of a thriller can take a surreptitious glance at the final page to see who was responsible for the murder in the first chapter, so the primary producer can read his fate in the figures of steel production in the leading countries.

To understand this, however, may be small comfort to those who are seeking a means for salvation or relief, but an understanding of the forces at work is perhaps the first and most important stage towards evolving a means for their control, however long-term such a procedure may appear to be.

In the meantime, while pondering this weighty question, the grower of crops may perhaps take some small comfort from the fact that steelmen in the United States are firing some of their idle furnaces again instead of firing idle workers. And their British counterparts are still in favour of the project for a fourth strip mill.

Perhaps, after all, there is a case for putting more land into cultivation next cropping season and buying that new tractor or farm vehicle.

Brighter prospects

HOWEVER THE problem arises: What is a poor planter to do when the information appears to be contradictory, as was the case during the first half of October, when the following news items appeared in the *Daily Telegraph:*

Steel output up in U.S.

New York, 6 October

American steel-producing centres are enjoying their best month of the year. Many firms are stepping up their operations this week to meet increased orders from car manufacturers.

Production last week was about 1.9 million tons, the highest for any week this year and about 71.5% of the industry's capacity. The magazine *Steel* said today that production this month may be 8.8 million tons.

This would be the largest output since last October, when the worst effects of the recession began to make themselves felt.

Heavy fall in steel output in Britain

London, 12 October

British steel production last month showed a heavy fall compared with September 1957. Output for the first nine months of 1958 was also considerably below that of the corresponding period last year.

The Iron and Steel Board last night said that production in September was at the annual rate of 19,169,000 tons, against 22,789,000 tons a year previously. The weekly average of output was 368,600 tons, compared with 438,200 tons.

Comparing corresponding quarters of 1958 and 1957, the Board stated that steel production in the first quarter of 1958 fell by 1%, in the second by 10% and in the third by 16%.

' During recent months ', stated the Board, ' the main decline in steel deliveries has been to the export trade and in the home trade, to collieries, makers of rolling stock, shipbuilders and, with the exception of ferro-concrete bars, to constructional engineers and builders.

' The reduction in deliveries is undoubtedly due in part to the running down of stocks by both public and private consumers.

' Deliveries of steel to consumer goods industries have been maintained, and exports of engineering products and other metal goods, which, in the second quarter of the year, were in terms of steel content 10% below those in the corresponding quarter of 1957, now show a rather more favourable comparison with last year's figures '.

What happens in the U.S.A. is the true indicator of the state of world trade, since steel production in that country is over five times as great as in Britain, and actually Britain has been following the U.S.A. into the temporary recession, which was the position not so

long ago in that country. Already as a result of the steps taken by the respective governments there is a feeling of rising confidence, not only in America, but also in Britain; there is what is described as a state of 'progressive prosperity', according to Don Iddon, reporting from New York. Markets are showing all the signs of a fresh upsurge and so we can look forward to increased demand and improved prices for the primary products of the earth. Prospects in the field of agricultural engineering and agricultural chemicals will be particularly good, since there are opportunities unlimited in world agriculture.

The establishment of an overseas trade organisation, with the necessary advisory and plant maintenance service, is, however, an expensive matter. It is easier to take the line of least resistance and stick to home trade, but there are obvious signs of saturation in this market. The answer lies in the grouping of companies who are manufacturers of agricultural machinery, chemicals, equipment and general farm supplies for their mutual benefit to share the cost of the sales, advisory and after-sales service.

The weakest link . . .

WHEN THE United Nations Organisation was set up it was intended to provide a forum where top-level diplomats could meet to discuss world affairs and work to promote the common good of all mankind. Subsequently, when the FAO was established, it was similarly intended that acknowledged leaders in the field of agriculture should establish a similar forum and build up a pool of experts, specialists and those with long experience in agriculture to work for the advancement of agriculture in all countries and to give material aid and advice where it was most needed and could do most good.

The original idea of giving aid to under-developed and needy nations was, indeed, one of the finest gestures ever conceived, but it is deteriorating and we have the spectacle of great nations competing in their offers of aid and of recipient nations cynically playing one great nation off against another. Furthermore, there is deterioration within FAO itself because the function of the Director-General is being developed on diplomatic lines and, in a misguided sense of fairness to all nations and to satisfy national aspirations, appointments are being made on the basis of a national quota for all the participating nations.

This so-called policy is utterly futile – a sop to rabid nationalism – an evil every bit as serious as imperialism and colonialism – to which it is, in fact, closely related. It is, furthermore, hardly complimentary to a recipient country to send second- or third-rate 'experts' to advise on or report on conditions in that country. It is worse than this: it is subversive to the good name and influence of FAO; it will not encourage real experts to offer their services to an organisation which is more concerned with politics than agriculture. Indeed, the strength of a chain is the strength of its weakest link.

Macro-nutrients

THE REPLACEMENT of the long-term economic crops of the tropics, which started before the war, is now well in hand. The rehabilitation of established industries involves two distinct processes: (1) the replacement of the existing stand with high-yielding or otherwise improved planting material, and (2) the rehabilitation of exhausted, eroded or leached-out soils, and in particular those of low inherent fertility or unbalanced nutrient status, which are exhausted in respect of one or more of the essential elements.

In the case of large estates, plantations or groups of planting companies, with adequate reserves for depreciation, put by over a long period of years, the rehabilitation of the soil is effected by the application of the NPK fertilisers, and in particular ammonium sulphate; rock phosphate, basic slag, or superphosphate; and muriate of potash.

The smaller properties and smallholdings are today in straitened circumstances, because of the low prices of primary products, the relatively higher prices of imported manufactured goods to which they have become accustomed, and the fact that they have no financial reserves whatever. During the times of high prices they put little or nothing to reserve, since they or their families needed a motor car and a share of the luxuries of modern civilisation, and their children have multiplied and re-multiplied beyond the financial capacities of their properties. The position is worsened when the productive capacity of the property decreases owing to the inevitable neglect caused by successive inheritance due either to the system of undivided or shared ownership, or the fragmentation of properties, which is nearly as bad in its effect.

In these circumstances it is not to be wondered at that, for the most part, nothing is done beyond the individual replacement of dead or unproductive plants by new plants, the stirring-up of the land for the preparation of the planting hole and subsequent weeding or cultivation – even this may be omitted, and half-starved cattle may also be allowed to damage or destroy the succulent young plants, due to lack of wire fencing.

It is not surprising that the second or third generation plants are prone to pests and diseases, and to metabolic disturbances due to malnutrition, and that the exports of tropical products from some countries are showing signs of declining. The position will be worsened where estates under sound management have changed hands, have been reduced to smaller properties and the new owners are either too poor or incapable, or too indolent to maintain them properly.

The first reaction to the onset of serious outbreaks of pests and diseases is to apply curative or preventive

measures to keep the trouble within bounds – the underlying cause, *i.e.* malnutrition, is either not understood or is ignored through lack of funds. An essential need of the backward or undeveloped countries today is an adequate supply of fertilisers, and the question that naturally arises is how are they to be paid for.

The West may be enjoying a period of prosperity through the astonishing increase in productive capacity during the past two decades. The overriding fear of war and the desire to ensure the maximum yield from the land has led to such an increase in the use of artificial fertilisers at home that little is available for export. But tropical countries also need to apply artificial fertilisers if the supply of foods and raw materials from the tropics is not only to be maintained, but also increased. There is a strong case for aid in the form of the supply of artificial fertilisers to backward or underdeveloped countries.

Micro-nutrients

THE APPLICATION of the trinity – NPK – is not, however, the whole of the story. As Richardson has pointed out in a previous issue of this journal, there are some 15 essential nutrients which are required for the healthy development of plants. Hitherto it has been the practice to place considerable emphasis on those elements which are required in the largest amounts – the macro-nutrients, as they are called – and, where there is a sound system of crop rotation and a good loamy soil, it should be sufficient to renew the soil with one or more of these major nutrients after each crop has been removed.

In the case of the soils in the tropics, many of which are poor soils or have become so through the leaching action of warm rain in the form of torrential storms or the destructive action of the hot sun, it is a different story, as the same crop has been produced on the same land, year after year, for 50 to 100 years. It can be easily appreciated that the amounts of one or more of the trace elements present in the soil may fall below the critical level and it then becomes a matter of importance that these deficiencies should be made good.

It is all too readily assumed that these are supplied along with the NPK fertilisers, but a recent communication by Stojkovska and Cooke to *Chemistry and Industry* (42 of 1958) has shown that they will make little contribution to the micro-nutrient status of soils and will supply considerably less of these elements than may be removed by the crop. Thus where there is a positive deficiency of a micro-nutrient the fertility status of the soil will not be improved simply by the application of a standard fertiliser mixture. This will explain the lack of adequate response which is sometimes reported for NPK applications.

The two authors observe, however, that ' materials applied at the rates of several tons per acre, such as farmyard manure or limestone, may provide much greater quantities of micro-nutrients, approaching the amounts applied as sprays to correct these deficiencies in crops '. Such bulky materials are difficult to collect, process and apply and, furthermore, the supply of farmyard manure, already insufficient to meet all requirements, will decline with the increasing mechanisation of agriculture all over the world – which appears to be inevitable. It is quite apparent that trace elements, such as boron, copper, manganese, zinc, molybdenum and iron, and the major nutrients, calcium and magnesium, will need to be applied, together with NPK, to those exhausted soils that need them, if full productivity is to be maintained.

What is, in fact, overdue is the appointment of a panel of agronomists to study the full nutritional requirements of those major economic crops of the tropics which are not grown under a system of rotation and so will inevitably lead to the reduction of the nutrient status of the soil below the critical levels in respect of one or more of the 15 essential mineral elements. Each member of the team will need to find suitable indicator plants to carry out pot trials on each of the soil types on which his crop is grown and will need to consider all relevant factors, such as the mineral content of the moving subsoil waters, and mineral fixation and nitrogen destruction problems. The requirements of each crop would be a life study and the results would be of great benefit to mankind.

Tinkering with the law

AT THE recent Annual General Meeting of the Rubber Growers' Association, the Chairman made some pertinent remarks concerning the position of natural rubber *vis-a-vis* synthetic rubber. While he considered that the two industries were at present complementary, this gave no room for complacency, for he visualised a time when they will become highly competitive. To meet this situation he considered it imperative that estate efficiency be still further improved in order that rubber may be produced at a substantially lower cost than that of synthetic rubber. He stressed the fact that no artificial tinkering with the law of supply and demand is likely to provide an effective substitute for estate efficiency. It is refreshing to find that the rubber industry seeks thus to maintain its position in the face of the challenge of synthetic rubber.

Looking back over the past 40 years, one may well be astounded by the progress made in every aspect of natural rubber production. The clean-weeding system which resulted in widespread erosion was replaced by cover crops, selective weeding and other methods which not only conserved the soil, but provided the right ecological conditions for the trees; systems of fertilising helped to restore fertility in eroded areas and to maintain fertility in newly-planted estates; budgrafting gave a new concept of yield capacity, while factory procedure has enabled the industry to offer a

product conforming more closely to consumers'needs. It is thus evident from the Chairman's speech that not only are producers alive to the necessity of reducing still further the cost of production and improving the technical properties of natural rubber, but are convinced that this is possible.

Usually, Government intervention in agriculture is directed to stimulating production, attempting to make a country self-supporting, or curtailing production in order to maintain prices. In its efforts to please everybody it not infrequently finds itself attempting to benefit both producer and consumer at the same time – and, not surprisingly, failing in both directions. At best it provides an interim means of alleviating the plight of producers or consumers pending a sounder solution of the problem. It is acceptable as a palliative, but not as an alternative to independent action on the part of the cultivator – and the best cultivator is the one most conscious of his independence. The determination of the rubber industry to maintain its position without the doubtful advantages obtained by tinkering with the law is, a measure of its health and virility.

Commonwealth in Kensington

WE RECENTLY had occasion to visit the extensive exhibition galleries of the Commonwealth Institute, formerly known as the Imperial Institute. These permanent displays for every country and territory in the Commonwealth are, viewed as a whole, lively, colourful and effective. This Story of the Commonwealth – its peoples, its life, its scenery and its resources – presented visually and in human terms, is at once impressive and illuminating.

To go all round the galleries is quite a long walk, but a vastly instructive one, even for those whose workaday interests keep them in close and knowledgeable touch with the activities and productions of commerce. Although the exhibits devoted to economic subjects do not predominate, the productive activities of the Commonwealth countries are bound to take an important place in their general displays. Thus many exhibits, notably the magnificent dioramas, of which the Institute has the finest collection in the world, show not only how the familiar commodities and articles of commerce and trade are produced, but give them a background, both human and geographical.

But perhaps the general effect on the visitor is not less important. Most well-informed people are more or less aware of the vital contribution made by the Commonwealth to the world's supply of foodstuffs and raw materials for industry. Wheat, rubber, copra and jute spring at once to mind as products of prime importance in the commodity markets, while fruits, fresh, dried or canned, and wines from the Commonwealth are familiar items in the shops. But to be brought face to face, as one is at the Institute, with the overall picture – to be confronted with such an impressive visual summary of what lies behind statistics and trade returns – is at once to understand in a special and perhaps more valuable sense the volume and diversity of the productive achievements and potentialities of the Great Commonwealth. ' Common wealth ' is indeed an apt descriptive term for this free but interdependent association of nations and peoples.

Let no one think this unique exposition is neglected by the public, for we were informed that some half-million people visit the galleries every year; but many more could do so with much profit to themselves. This is especially true of our readers from overseas, who should make the Institute a ' must ' when they come to London.

Water Hyacinth

WATER HYACINTH was seen for the first time in the Nile last winter and experience throughout the tropics indicates that this might well be a catastrophe for the Sudan, according to a report by Barclays Bank D.C.O. from Khartoum.

This weed is capable of moving upstream and already the Bahr El Gebel is said to be in danger of being blocked. The pump schemes adjoining the White Nile will undoubtedly be troubled by the plant, says the report. The water hyacinth could appear in the Blue Nile as mysteriously as it did in Bahr El Gebel. In such an event the prospects for the Gezira cotton-growing area would be exceedingly poor (see also WORLD CROPS, 1958, **10,** 286).

'S' or 'Z'

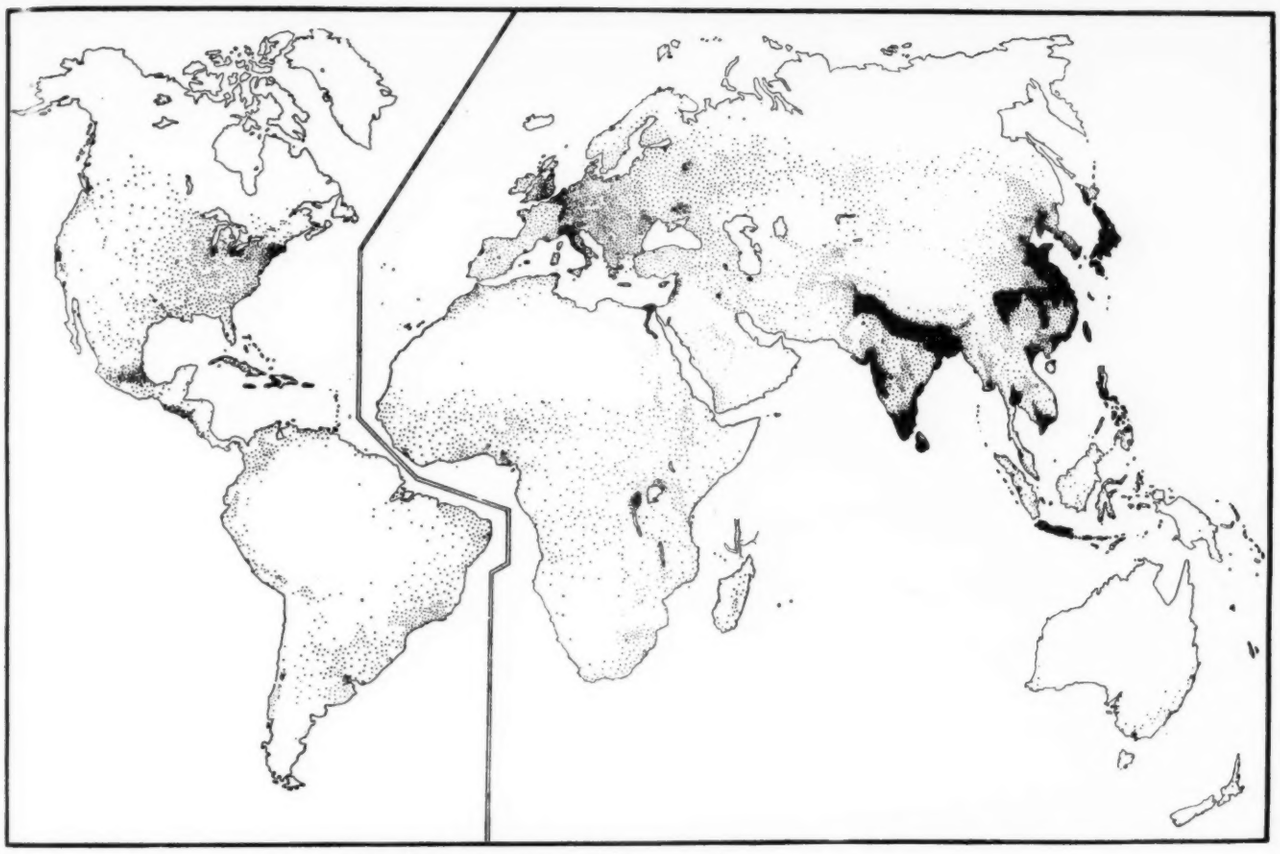
A CORRESPONDENT has written as follows:

> I note that you prefer to spell fertilizer with an ' s ' and not with a ' z '. I have always regarded the word fertilise with an ' s ' as referring to the essential process involved in sexual reproduction, fertilize with a ' z ' as referring to any action which increases fertility, *i.e.* productivity. Have I got these two concepts reversed?
>
> Yours etc.,
>
> CYRIL L. WHITTLES.

Either is correct, but it is our standard practice to use ' s ' for ' z ', as in ' mechanisation '. The Oxford Dictionary uses ' z ' both for manuring and for the biological process, although ' s ' is given in a quotation.

This use of ' z ' for two different meanings has always seemed to us unnecessarily confusing, just as the use of the general word ' manuring ', when ' fertilising ' with chemical fertilisers is meant, is also misleading.

We suggest a distinction is necessary and propose to use ' z ' for the older biological meaning, ' s ' for the act of applying chemical plant nutrients to the soil; ' manuring ' for the application of dung, compost, farmyard manure, seaweed, green manures, wood ashes and other materials of direct organic origin and ' fertilising ' when minerals or chemicals such as rock phosphate, ground limestone, muriate of potash, ammonium sulphate, urea or cyanamide are applied to the soil.



Disposition of world population. 1 *dot* = 100,000 *persons*
From THE OXFORD ATLAS. By permission of The Clarendon Press, Oxford.

Standing Room Only

F. C. COOKE
(*Editor, ' World Crops '*)

THE expression ' standing room only ' with regard to the problem of world population was used by Prof. L. D. Stamp in a recent article in WORLD CROPS, but this state of affairs can never actually be reached because some disaster of immense magnitude will have occurred, or we will have been forced to control population. The colonisation of neighbouring planets obviously does not offer an early solution, particularly as this will require the movement of one or two billion people for a satisfactory solution of the problem of excess populations.

The Report on the Family in Contemporary Society (prepared by a distinguished committee for the consideration of the Lambeth Conference in July this year) expresses a note of sombre, almost panicky warning with regard to the under-developed and over-populated regions of the world.

We stand today at the threshold of an explosive increase in population . . . an explosion more widespread in its consequences than the atom bomb. We are producing more and still more food to meet the needs of the increasing world population, but this will be of little avail against the increase in population in the more overcrowded regions of the world.

At the Conference, the Archbishop of Canterbury said: ' In lands where population is out-running food supplies, population control has become a necessity . . . abortion and infanticide are to be condemned, but methods of control, medically endorsed and morally acceptable, may help the people of these lands so to plan family life that children may be born without a likelihood of starvation '.

Surpluses and Starvation

It is an appalling thought that in a world with local food surpluses about one-half of the world's present 2,800 million people go to bed hungry, that in 40 years and at the present rate of increase, the population will have doubled again, and that in only 600 years from now (a mere speck in time), on the same basis, there will only be

one square yard per human on the earth's surface. This may appear so remote and far off as to be of no practical importance, but the actual danger is here and now – today – for an explosion is imminent.

The danger lies in those places and regions which are approaching a condition of 'standing room only' with regard to their cultivable land. Countries like mountainous China, arid India and Pakistan, tiny Japan, crowded Singapore island, the dense Settlement of Hongkong, the remote Seychelles, the West Indies, and even overcrowded Britain. These are the danger spots where the pressure of population is assuming explosive proportions.

By the year 2000, the present population of the earth will have doubled and, lest this should seem a long way off, this date is no further off than the year 1914 is behind us. The Report on the Future Growth of World Population, recently issued by the Department of Economic and Social Affairs of the U.N., states that: 'Man has at present the doubtful privilege of living through a unique period, since never in the history of mankind have numbers of the human species multiplied as rapidly as in the present century, nor can it be easily conceived that the peopling of the earth will continue at a similar pace in the century which follows'.

Reduced mortality rates

Only a hundred years ago about 150 infants out of every 1,000 born in Britain died before they reached the end of the first year of life; today the infant mortality rate is of the order of 25 per 1,000 births. Some countries have done even better than this: in Sweden the rate is 18.7 and in New Zealand 20.1.

In many backward countries the number of infant deaths were even higher than they formerly were in Britain; in some regions they were as high as 200 to 400 infant deaths per 1,000 births. Indeed, in villages in Egypt nearly 46% of the children used to die in infancy and only one person in six reached the age of twenty.

This picture is changing rapidly – too rapidly to be healthy – and among the factors which are producing this progressive rise in population is the enormous progress that is being made in death prevention.* As the control of killing diseases spreads throughout Africa, Asia and Oceania, the expectations of life and human reproductivity in these regions will grow enormously.

Production and population

Nevertheless, food production is also increasing and further advances in science and engineering may enable mankind to make far better use of the earth's resources than has hitherto been thought possible, but the most disturbing feature is the speed with which population is increasing *now*, and it is obvious that it will outstrip production within the lifetime of those alive today.

The successful use of technological advances in the field of agriculture, agricultural engineering and agricultural chemicals depends increasingly on the extent to which man can organise himself socially and internationally without having recourse to the ultimate and final madness of another world war. Given time, it is still possible for him to solve the problem, but time is growing short.

International goodwill

In this dangerous and explosive situation there is no room for intolerance either of the Right or of the Left. We live in one world, and peace today is one and indivisible. To those who quite sincerely would like to destroy the existing order of international society and build out of the ashes a 'brave new world' we would say: 'Have a care or there will be nothing left to rebuild after the nuclear bombs, the guided missiles, famine, disease, panic and total economic dislocation have dealt with the world population problem, once and for all'.

The responsibility on all national leaders is tremendous and must at times be unbearable, but goodwill can work wonders even in the most difficult circumstances. The greatness of the late-lamented British Empire was based on the pioneer spirit and the remarkable power to compromise, which is a characteristic of the British people, and it is this same adherence to the middle way which has successfully carried Britain herself through a bloodless social revolution, occasioned by the rapid increase in population here during the last century.

Material aid

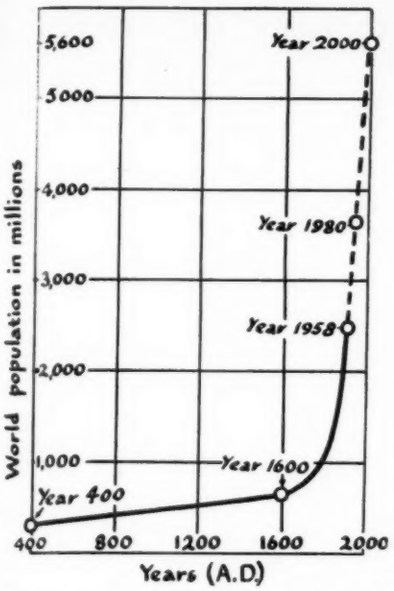
The West† is now prepared to give material aid to under-developed countries on a colossal scale (see WORLD CROPS, **9**, 90), advisers on land utilisation, and on the reclamation of waste

FAO photo.

Famine victims at Khulna in East Pakistan, 1952.

* WORLD CROPS, 1958, **10**, 199.

† World Bank decision, 9 October, 1958 (see *Daily Telegraph*, 10 October, 1958).



Estimate of the population of the world in 2,000 A.D.
U.N. Populations Div. estimates

lands are anxious to assist, the manufacturers of agricultural machinery and agricultural chemicals want to do business which will promote the welfare of these countries, and there is an urgent need for the investment of capital for the development of new lands and the replanting and rehabilitation of lands which have been under perennial plantation crops for 70 years or more. All these countries, *including China*, need to be importers of capital; in the present desperate situation there should be no barriers of race, religion or ideologies.

But there has to be the correct atmosphere of compromise and sweet reasonableness to create confidence. Political instability, uncompromising ideologies and religions, increasing lawlessness, financial malpractices, bad faith, intrigue and corruption do not inspire that confidence. What is needed today is the mutual trust and respect which used to prevail and, above all, a drastic slowing-down of the multiplication rate, particularly in the overcrowded countries.

A unique situation

The present situation is extraordinary and unique in the history of the world, and must be considered on this basis. Either we must suspend the operations of WHO, of medical missions, and of food relief schemes, so as to allow the forces of nature to do their worst, or the population problem must be faced up to. The cult of enormous families of 15 or more, who today mostly survive, and the promiscuous production of unwanted offspring by starving people to be abandoned or sold into some form of child slavery (which still goes on on a considerable scale) cannot be permitted to continue any longer.

We have interfered with nature to save human life; we have interfered with nature to increase the productivity of the earth; then why is it wrong to interfere with nature through the policy of family-planning to ensure that the impending explosion does not occur. Perhaps it is already too late and we must all resign ourselves to yet another struggle for *lebensraum* – only this time with all the infernal ingenuity of modern science misdirected towards an effective reduction of world population. Which is it to be?

A Plan for Mauritius

Irrigation schemes, agricultural experimental stations, increased food production, power supplies and tourism are among the fields of activity now being opened up under a £15,750,000 capital expenditure programme which has been launched by the Mauritius Government for the social and economic development of this important sugar-producing island in the Indian Ocean.

The main industry, sugar, at present provides the basis of the island's economy; Government finance will be applied to the development of other crops and of land not suitable for sugar. Mauritius imports more than half of her food and a large part of these imports could be replaced by local production. Tea production is also to be much expanded, since recent London sales have shown that Mauritius can produce high-quality teas, comparable to the superior grades of Ceylon and Indian teas and far superior to the African teas, with which Mauritius teas were formerly classed.

Self-sufficiency in timber within 25 to 30 years is the ultimate aim in forest development, the main provision for which – £30,000 – has been set aside for new access roads to open up 10,000 acres of Crown lands for afforestation.

The Arid Areas of Pakistan

The cultivation of alluvial soils in semi-desert areas which it is not possible to irrigate has led to thousands of square miles of land becoming derelict in Pakistan, according to Dr. E. W. Russell. An appalling problem has been created through the topsoil blowing away, the formation of sand-dunes and the creation of ' dust bowl ' conditions.

Even irrigated land, he said, is passing out of cultivation because of salt accumulations in the soil. This may be caused by the leakage of water from the irrigation canals raising the level of the ground water too near to the surface or because the amount of irrigation water available is insufficient to wash out the salts left behind after the irrigation water has evaporated away.

In Baluchistan, stabilising sand-dunes are being introduced to prevent the sand from encroaching on to good areas. The Forest Department are trying to fix these dunes by planting tamarind trees and sedge grasses. In this province they are even collecting water in the mountains, conveying it across a sandy desert in the form of an underground river to the area where it is used.

The search for water goes on. At Quetta an area is being prospected by means of explosive charges inserted into the soil. The effect is recorded by means of geophones (microphones) placed several miles apart, while an oscillograph is used to determine the make-up of the soil from a study of the shock-wave. In this way it is possible to determine the depth of the aquifers or of the underground rivers.

World Agricultural Census by F A O

The Director-General of the Food and Agriculture Organisation, Mr. B. R. Sen, has asked European countries to make available statistical experts to assist countries in other parts of the world to provide data for the 1960 world census of agriculture. Preliminary work on the census has begun and FAO already has its experts working in 25 countries.

Mechanisation on Coconut Plantations

RAY WIJEWARDENE, M.A. (CANTAB.), M.I.E.C., M.A.S.A.E., A.M.I.B.A.E.
(Ceylon)

THE introduction of the machine into coconut plantations has resulted in a revival of interest in the purpose of cultivation and its effect on the palm, a problem which hitherto had been obscured by the limitations of animal-drawn implements on the one hand and the more popular interest in the quick results to be obtained through the use of artificial fertilisers on the other.

Cultivation practices on coconut plantations have varied considerably in different countries. In India, cultivation is perhaps more intensive than elsewhere, varying from normal ploughing before the rains and harrowing just before the onset of the dry weather to the interesting practice of heaping the soil into mounds about a foot in height at the end of the rainy season in August–September and spreading these out in December – January in the middle of the dry season.

The coconut industry is often considered to be a backward and in some places a deteriorating industry. The splendid drainage and irrigation work in Malaya and the fertiliser and cultivation practices in India and Ceylon can be most effectively and rapidly carried out by mechanical aids.

Ploughing and Cultivation

It is probable that India has gone further than others into the agronomic side of cultivation on coconut lands in recent times[1] and their results on laterite soils indicate that ploughing, even to a depth of 6 in., three times a year produces the highest yield commensurate with the expenditure incurred. This view is supported by recent work carried out by Paltridge[2] in Ceylon, who found that these soils have a tendency to fix available potash, which is subsequently released by cultivation, aeration and drying.

Whereas the customary practice on coconut plantations in Ceylon is ploughing to a depth of about 4 in. in the rainy weather, and harrowing at the start of the dry weather, either annually or biennually, very little cultivation is done in Malaya, due probably to the more favourable soil and rainfall conditions and the primary need to make drainage the first cost in these low-lying clay soils.

The wide variety of soils upon which coconuts are grown – clays, laterites, loams, recent volcanic peats, and sands – and the associated factors, such as the regularity and amount of rainfall, the level and fluctuations of water table etc., make it both impossible and inadvisable to lay down hard and fast rules for the cultivation of coconut soils, which must necessarily always depend on conditions.

The 3-furrow disk plough cultivating in the row between the palms. The development of the shallow drain can be seen

Left:

A tractor-drawn roller mulcher keeping heavy surface growths under control. The tractor is a Massey-Ferguson '35'

Soil conservation

Apart from the fundamental necessity for controlling weed growth to simplify nut collection, and to eliminate competition with the palm, there is now adequate evidence in favour of regular tillage of coconut soils, particularly the laterites, providing that protection can be afforded against loss of organic matter and soil erosion.

The latter is easily dealt with nowadays, for with a mechanically-drawn ridger, or even with a disk-plough, contour ridges can be made on undulating land to reduce surface run-off. The question of conserving organic matter is a little more complex. Whereas most of the coconut soils in Malaya do not suffer from a shortage of organic matter, being mostly of peaty origin, this is a definite problem in India and Ceylon.

Green cover

In India, the practice of growing and turning in a green manure crop builds up the soil, while also undergoing the stirring and aeration afforded by tillage. The practice recently adopted in parts of Ceylon of planting fast-growing, perennial pasture grasses, such as *Bracharia brizantha* and *Stylothanthis gracilis*, both of which appear to thrive on cultivation, is observed with interest, as it produces a second

A tractor-drawn serrated disk harrow used for light tillage, for turning in broadcast manure, and for weed control between the rows of palms

crop through the medium of animal husbandry. This integration of animal husbandry with coconut growing is to be encouraged as a fundamentally natural and desirable practice for the improvement of the soil.

Drainage

Drainage is the most important cultivation practice for the low-lying coconut lands of Malaya. In parts of Ceylon, too, it is very necessary, as the palm cannot endure wet feet, particularly where the water is stagnant. In both Malaya and Ceylon heavy ditching machinery is used on clay soils to shovel out a system of drains so as to lower the water table; this is a never-ending operation, for the pores in the soil leading to one set of drains soon become choked and fresh channels have to be dug to release the water. For this purpose, tractor-mounted ditchers and even heavy drainage machinery have been used.

Where drains of over 2 to 3 ft. in depth are not required, shallower drains and feeder drains are easily constructed, using a disk-plough between the rows of palms, throwing the soil outwards, towards the rows, and working inwards towards the centre of the avenue. A few years of cultivation in this manner results in a gentle slope between the lines of palms towards the centre of each avenue, with about a 2-ft. difference in levels.

The advantage of this method of forming drains over the conventional method of digging a ditch by hand labour is that the gentle slopes and undulations which result do not interfere with other mechanised cultivation and weeding operations. A further advantage is that falling or cut nuts roll down the slope to the centre of the avenue, and so are more easily collected.

Manuring

Two methods of manuring are practised on coconut plantations, one which involves broadcasting the manure or fertiliser evenly in the avenue between the rows of palms, and the other, known as 'ring-manuring,' which requires the fertiliser to be forked or folded into the soil in a circle, 2 or 3 ft. in radius, round the base of each palm.

Whereas broadcasting can be done with the conventional muck or lime spreader, the cost of the implement is only justifiable on the largest plantations, since labour rates for broadcasting fertiliser are comparatively low. It is also usual to harrow or mulch a broadcast application of fertiliser to reduce wash-off in the event of heavy rainfall following the application.

Ring-Manuring

Ring-manuring is the practice of concentrating the fertilisers at the base of each palm, which has certain advantages in overcoming the tendency in lateritic soils to fix nutrients below a certain concentration level. The smaller market-garden type of rotary cultivator is useful for the cultivation of the circle of soil over which the fertiliser has been sprinkled in order to turn the mixture into the soil. This operation can be done for a fraction of the cost of manual cultivation, and due to its speed a very much larger acreage can be covered, when weather conditions are favourable, than was formerly possible.

Type of equipment

The wide variation in size of plantations and holdings requires a variation in the type of mechanical equipment

The process of ring manuring. The manurial mixture has been sprinkled over the ground and is being turned in. Note the animal grazing in the background

to be used. Generally, a good coconut plantation, 200 acres in extent, is about the smallest upon which a light four-wheel tractor can economically operate, unless, of course, there is a demand for a hire service in the neighbourhood.

On smaller holdings the smaller horticultural cultivator is proving popular, and also on the larger plantations, but only for specific jobs, such as ring-manuring, the preparation and weeding of nurseries, and keeping the ground clear of weeds round young palms.

Irrigation

Hitherto almost completely ignored in areas with erratic and uneven distribution of rainfall, is the advantage to be gained from artificial irrigation, particularly of the pipe-borne ' sprinkler ' types. It is regrettable that more is not known of the requirements of the palm in so fundamental a requirement as water, as compared with its manurial requirements.

From such theoretical data as is available, based on both leaf area and transpiration rates, it would appear that the minimum requirements of the palm are 1 in. of rain a week, and preferably between 1 and 2 in.[4] The higher yields obtained in Malaya with its heavy and even distribution of rainfall over the year are thus understandable.

Average and record yields

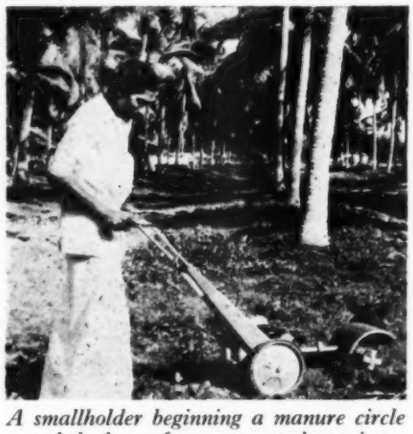
The record yield in India, too, of over 13,000 nuts per acre per annum was obtained mainly through regular, though manual, irrigation. This is three times the acknowledged good yield of 4,000 nuts per acre obtained on some well-managed plantations, and far removed from the normal overall average of 1,500 nuts per acre. Conversely, one can recall the appalling drop in crop which follows a serious drought or a failure of the monsoon to get some idea of the great benefit to be derived from some form of artificial irrigation during such periods.

The irrigation rates required are well within those obtainable through the use of any of the better known brands of sprinkler irrigation equipment now available, and the results may well prove to be the greatest benefit rendered so far to the coconut industry through mechanisation.

A smallholder ploughing his coconut garden with a market-garden tractor

Nursery management

For the preparation of the seed bed the rotary cultivator has proved particularly beneficial in providing a deep but soft and well-aerated tilth, thus causing less damage to the young roots when the seedling is subsequently removed for transplanting. The seednuts, usually planted in rows 2 ft. apart and with 1-ft. centres along the row, are nowadays kept free from competitive weed growth by the use of garden and horticultural types of tillers, which enable one labourer to do the work of a whole gang.



A smallholder beginning a manure circle round the base of an unseen palm, using a Gardenmaster cultivator

Planting out

When planting out the seedlings in the field it has long been the practice in Ceylon to start them off well by providing a deep and carefully tilled planting hole. The advent of the rear-mounted post-hole borer for the standard 4-wheeled tractor has found ready acceptance and quite a few techniques have now been developed around this implement, the most popular being the 5-hole method,[5] whereby the 1-ft. dia. auger bores four holes, each 3 ft. deep, at the corners of a 3-ft. square, with the fifth in the centre. These holes are filled with coconut husks, leaf mould and fertile top-soil prior to the seedling being transplanted into the centre hole. This technique has been found to give the seedling an ideal start in its new surroundings and at a fraction of the cost of the manual methods previously employed.

The home-garden type of multi-purpose machine used for slashing cover crop

The human problem

Of fundamental importance is the effect which mechanisation has on plantation labour. Labour is getting more and more difficult to obtain in all tropical countries and wages are rising in consequence. As in other industries, labour is demanding a higher wage and must be expected, in return, to give higher unit productivity if costs are to remain stable and competitive. The proper application of mechanisation to the coconut industry is the tool whereby the worker can raise both his productivity as well as his standard of living.

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Seychelles Vanilla-I

A Valuable Orchid Crop

J. F. GUY LIONNET

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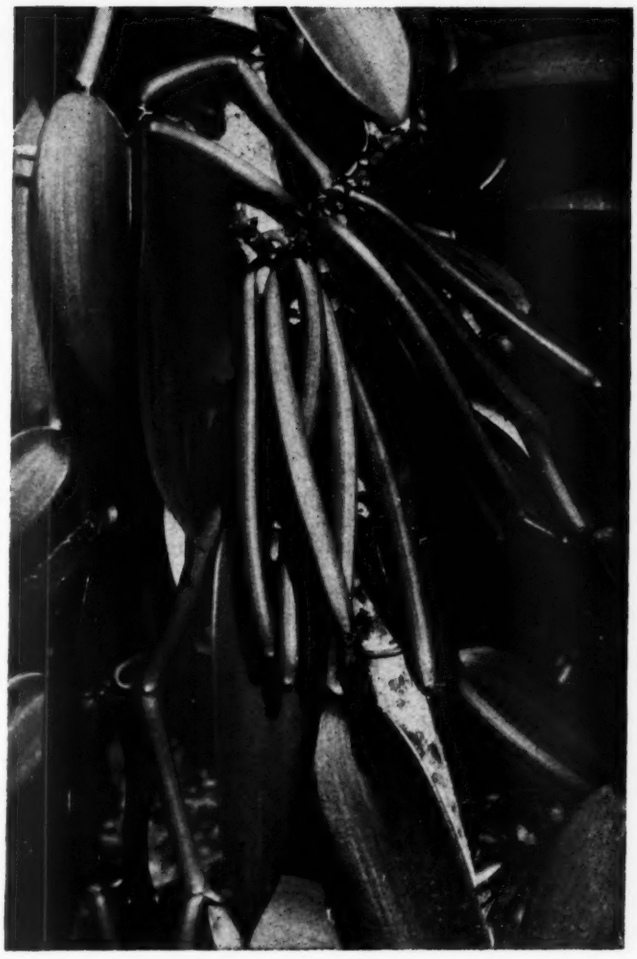
Vanilla is an important tropical crop, containing vanillin, which is used as a flavouring agent in the manufacture of chocolate, confectionery and perfumery. Here the author describes the propagation and management of the plant.



The orchid Vanilla fragrans. *A vanilla vine clinging to its supporting plant and bearing a cluster of ripe green pods. The plant has a strong stem and thick leaves and attaches itself by aerial rootlets to the ' support '. The fruit is a pod 10 in. long and about ½ in. in dia.*

Photo: Kantilal Jivan Shah

THE two major industries of the Seychelles islands are copra and cinnamon, but minor industries, such as patchouli and vanilla, also contribute to the economy of the colony. Vanilla was one of the earliest agricultural industries and the first export – 110 lb. – was made in 1877.

Towards the end of the last century the vanilla industry expanded rapidly and for several decades brought great prosperity to the islands. Thus from 1890 to 1903 the Seychelles exported as much vanilla as the French colony of Réunion (Bourbon), one of the earliest producers, and more vanilla than all other British colonies put together. In 1901, the export was over 70 tons, valued even then at some £70,000. By 1920, however, through the advent of synthetic vanillin and to a fungal disease which wiped out whole plantations, export had fallen to some 20 tons. In the last 20 years production has fluctuated between ½ and 7½ tons per annum. Due to increased and sustained prices, a revival of the industry is again taking place; new areas are being planted and more attention is being given to the old plantations. With favourable conditions, a 100% increase in production can be expected.

Seychelles vanilla pods are obtained from the orchid *Vanilla fragrans* (Salisb.) Ames, the most grown and better known of the three cultivated vanillas. This orchid was originally introduced from Réunion Island into the Seychelles in 1866, but it is stated by Dupont that the vanilla plantations of Réunion, Mauritius, Seychelles, Madagascar and the Comoros all derive from a single cutting, which was introduced into Réunion from the ' Jardin des Plantes ' in Paris.

Growing conditions

At first it was grown chiefly in the forest areas of Mahé Island – the main island of the Seychelles archipelago – where the soil was rich in organic matter. Following deforestation, erosion and the fungal disease referred to, which is especially prevalent under humid conditions, vanilla was driven to the drier islands of Praslin and La Digue, where it is grown both on the lateritic hillsides and on the sandy rendzina* soils of the coastal flats.

Vanilla does best in a warm and moist climate, with abundant but not excessive rainfall; a range in temperature of 70° to 90°F and a rainfall of 100 in. per annum are considered to be the optima. Because of its temperature requirements, vanilla does not do well at high altitudes, and a dry period of two months in the year is also necessary to foster regular flowering. These conditions are obtained in two belts situated between lat. 15° and 20°, north and south of the equator. The granitic islands of the Seychelles are outside these limits, being situated between 4° and 5°, south of the equator. As a result, although growth and vigour are good, flowering is often poor. So much so that on average one good crop is obtained only once in every three to four years, though the quality of well-prepared Seychelles vanilla is excellent.

*Rendzina: soil of coral origin.

The plantations

There are two types of vanilla plantation in the Seychelles: the hillside and the flat coastal plantation. Both on the hillsides and the coastal flats vanilla is sometimes grown among coconuts and casuarinas.

The hillside plantations are rather a relic of the past; they consist usually of vines which have been planted near a variety of naturally occurring trees or bushes, which act as supports. As a result the plants are irregularly scattered over relatively large areas, wherever suitable supports can be

Photo: Hon. Mathew Ridley

Line-planted vanilla. The plants are growing on physic-nut supports in the shade provided by casuarinas, and with a mulch of overlapping coconut husks

found. The commonest supports used in these plantations are 'Café Marron', *Randia laevifolia*, ' Bois Dur ', *Canthium bibractaetum*, and cashew-nut, *Anacardium occidentale*. The hillside plantations have the reputation of producing better crops and of being more resistant to fungal disease.

The vines on the coastal flats are usually line-planted on supports that have been specially grown for the purpose. The supports that are commonly met are physic-nut, *Jatropha curcas*, ' Bois Chandelle ', *Dracoena reflexa*, and ' Var ', *Hibiscus tiliaceus*. An acre of coastal flat can grow from 1,500 to 2,000 vanilla plants, but the same area on the hillside will seldom have more than 600 to 1,200 plants.

A special feature of Seychelles vanilla is that it is chiefly a small landowner's crop. There are very few growers with more than 15 acres of vanilla; a few have 5 acres or more, but the majority have an acre or less. Thus, while the total area under vanilla in the Seychelles does not exceed 300 acres, there are some 200 growers.

Planting material

Vanilla is propagated by cuttings. Seedlings are extremely rare in nature and seldom come to bearing size. Only under very special conditions in Porto Rico and Madagascar has vanilla been grown from seed. Hybridisation has been carried out at research stations in both these countries.

In the Seychelles, cuttings, 3, 4 or 5 ft. long (usually eight to 10 internodes), from strong, healthy plants are normally used. They are tied to the supports and are allowed to trail on the ground for a distance of 10 to 12 in. (three to four internodes), the trailing end being buried under 3 or 4 in. of soil, except for the extreme end, which is not buried and is allowed to dry in the air. Although longer cuttings flower and start bearing earlier, young, short cuttings are sometimes preferred, as they are said to produce healthier and more vigorous plants that will last longer. Cuttings obtained from non-bearing vines, such as those that grow unattended to a great height in the forests, have also the reputation of producing better plants. Planting is usually done at the beginning of the rainy monsoon, *i.e.* in October or November.

As vanilla is an orchid and essentially a surface feeder, more attention is paid to the creation of a good mulch than to soil cultivation. Normally in the Seychelles the soil is hardly touched before planting, though a light cultivation is sometimes carried out. On the hillsides, weeds and other ground vegetation, when cut or uprooted, as well as loppings from the support plants, are applied to the base of vanilla plants.

Mulching and manuring

On the coastal flats, mulching is often carried out with coconut husks in a way which is characteristic of the Seychelles vanilla plantations. Coconut husks are placed in overlapping rows 18 in. from the base of the plants, the space between the husks and the vines being filled with almost any vegetable matter, such as weeds, decaying coconut husks, leaves and loppings from the support. The rows of coconut husks not only provide food in the form of potash-rich organic matter, but they also conserve moisture and hold the layer of mulch in position, creating the limited but deep and rich root zone that vanilla favours.

What may be termed ' young ' (*i.e.* only slightly decomposed) vegetable matter is preferred to more highly decomposed material for mulching. Animal manure, however, is considered detrimental, unless it is well rotted and mixed with compost. Fertiliser experiments carried out in Madagascar and the Comoros have given little or no results. In the Seychelles, apart from the potash-rich coconut husks, no manure or fertiliser is applied.

Although vanilla is reported to grow best on soils of volcanic origin, rich in soluble nutrients, it does well on a variety of soils, even poor ones, provided there is good drainage. As vanilla takes little from the soil itself, feeding mostly on the surface mould, a poor, but well-drained, sandy soil with deep surface-mulching provides, perhaps, the ideal ground for vanilla. In the Seychelles the poor sandy rendzina soils of the coastal flats, when supplied with enough organic matter in the form of mulches, are good sites for plantations.

Potassium and calcium appear to be the dominant mineral elements in vanilla. Potassium is present in large quantity in the pods, while calcium is especially prevalent in the leaves. The beneficial effect of coconut - husk mulching in the Seychelles may be partly due to their high content of potassium. The high calcium content of the rendzina soils may be one reason why these soils are so suitable for vanilla. Another element that is claimed to be important for vanilla is chlorine. It is the sodium chloride provided by the sea that is said to be responsible for the vigour and good growth of vanilla vines growing on isthmuses and promontories. That may be equally the case with the vanilla plantations of the Seychelles coastal flats.

Care and cultivation

After a plantation has been established, cleaning and mulching (which are carried out simultaneously, since the weeds and vegetable detritus collected during cleaning are used as mulching material) must be done regularly two or three times a year. In the Seychelles it is sometimes the practice either to stop mulching or even to remove part of the mulch, near flowering time, to induce the vanilla to flower.

Judicious lopping of the living supports is also very important, to give only light shade to the vanilla plants. It is generally admitted that insolation or light intensity should be reduced to one-third or one-half to produce the best conditions. Heavy shade not only

encourages fungal diseases, but also affects the quality of the pods after curing, while too much light produces the yellow and weak vines that are also prone to disease. In certain countries it is recommended to have two shade trees: the 'supports' to provide immediate shade and taller trees to act as light filters. This condition is sometimes to be obtained in the Seychelles, when vanilla is grown among coconut palms and casuarinas. A heavy lopping of the supports is usually carried out in the Seychelles just before flowering time, so as to induce the vines to flower.

Pruning

It is well known that if the vegetative growth of a vanilla vine is stopped by pruning it is induced to flower. This is a recognised way of encouraging flower formation in most of the producing countries. In the Seychelles, where climatic conditions are not always favourable, pruning of vanilla vines, eight to nine months before flowering is expected, is essential if a satisfactory crop is to be obtained.

At pruning time special bearing branches, called 'porteurs', are prepared. These are shoots which, when 3 or 4 ft. long, are bent down round a branch of the support, slightly twisted in the process, and tip-pruned at about 18 in. from the soil. Any shoots appearing on the 'porteurs' themselves are cut off when 3 or 4 in. long, but the shoots appearing on the rest of the plant, before the bends, are allowed to grow. They will constitute the 'porteurs' of the following year. As a result there is a decreased sap flow towards the 'porteurs', which favours flower formation. After cropping, the old 'porteurs' are cut off. Meanwhile the following year's 'porteurs' have already been prepared.

The aspect of a vanilla plant, after three or four years, is therefore that of a vine with a number of shoots hanging down over the branches of the live support. There are usually from five to six 'porteurs' per plant, but strong vines have more. This preparation of selected bearing shoots is a special characteristic of the Seychelles vanilla industry.

Under favourable conditions a vanilla vine makes rapid growth, as much as an inch in 24 hours. A small crop may be expected from 18 months to two years after planting. A good crop is usually obtained only after three years. A plantation should be renewed after seven years, but old plantations which are allowed to carry on sometimes continue to bear good crops; good plantations of 12 or even 20 years are sometimes found.

Crop fluctuations

Only once in three to four years is a good vanilla crop obtained in the Seychelles. This irregularity in cropping is attributed to unfavourable climatic conditions at flowering time, a dry period being necessary for the formation of the blossoms. Thus dry periods at flowering time in 1945, 1947, 1951, 1952, 1955 and 1956 were responsible for good crops in 1946, 1948, 1952, 1953, 1956 and 1957.

The effect of a dry period may be explained by Klebs' Ratio: a factor which increases carbon absorption or diminishes absorption of nitrogen, increases the ratio C:N and favours flowering. The lopping of supports and shade trees (which increases insolation and therefore carbon absorption) and root and stem pruning or damage (which diminishes absorption of nitrogen) undoubtedly have this effect. Even in a good year only 50 to 75% of the plants of most vanilla plantations come into flower. Flowering may also be inhibited by rain, which turns flowering into vegetative buds. It takes two months for a bud to come into flower.

Flowering time in the Seychelles is mainly in September and October, which, unfortunately, coincides with the beginning of the rainy monsoon. As the fertilized pods take from eight to nine months to reach maturity, cropping is effected in May and June.

Pollination and fertilization

Except in vanilla's native Central Mexican country, where it is said that they are sometimes naturally pollinated by bees of the genuses *Melipona* and *Trigona* and by humming-birds, vanilla flowers must be pollinated by hand. When vanilla was first introduced into new countries, it was more an ornamental than a cultivated plant, because artificial pollination of its flower was unknown. The Belgian botanist, Charles Morren, was the first to pollinate vanilla artificially in 1836. The simple and practical method now in use in most of the producing countries was designed, however, by a young slave of Réunion Island named Edmond Albius in 1841.

Artificial pollination of vanilla is more easily done than described. The pollen is covered by a sort of hood or cap and the stigma is protected by a lip, known as the rostellum. Pollination is effected by pressing the rostellum under the broken anther cap to bring the pollen in contact with the stigma. All that is needed for this operation is a small pointed piece of wood the size of a match.

As the vanilla flower opens during the night, and as it does not last long, pollination is effected in the morning; afternoon pollination is often unsuccessful. If pollination has been successful, the perianth withers, but remains attached to the ovary, which then increases in size. If pollination has been a failure, the flower drops off the next day. As the ovules are still at the embryonic stage at the time of pollination actual fertilisation takes place only growth of month after pollination, the about one the pollen tubes causing the ovules to mature through hormone action.

As the operation is a rather delicate one, women and children are usually employed to do it, because of their lighter touch, and, where vanilla is grown, schools have sometimes to start later in the day, during the short flowering season, to enable children to do their task in the plantations. From 800 to 1,000 flowers can be

Photo: Hon. Mathew Ridley

The vanilla flower. A 'porteur' bearing two racemes and showing buds, and fresh and pollinated flowers

pollinated by an adult in one morning.

As a rule a ' porteur ' will bear one or two racemes of flowers, rarely more. The number of flowers to be pollinated on each raceme depends on the vigour and age of the plant. In order to obtain fine long pods, from eight to 12 pods are kept on each raceme, less if the plant is weak. It is recommended to pollinate flowers on the outer and side parts of the raceme, discarding those towards the centre, which produce short and curved pods. After obtaining the required number of pods on a raceme, some growers prune off the terminal part of the raceme and small, short pods are also taken off. On average, 10% of the pollinated flowers do not set; dry weather is favourable to setting, while moist weather is detrimental.

While dry weather is essential before and during the flowering season, rain is necessary soon afterwards, if the fertilised pods are to make good growth. Prolonged dry weather after flowering often results in the withering and loss of a large number of pods. If mulching has been stopped or even partly removed to induce the vines to flower, it is replaced as soon as possible after flowering to encourage continued good growth of the pods.

Diseases

The only serious disease of vanilla in the Seychelles, and referred to above, is an anthracnose, whose causative agent is the saprophytic fungus, *Glomerella vanillae* (Zim.) Petl., which under certain conditions of humidity and vine debility invades the stems, leaves and sometimes the fruits of vanilla plants through bruises and cuts. Dupont considered that the disease originates in the roots and he stated that the causative organism is suspected to secrete a toxin in the soil, rendering it unsuitable for vanilla.

This disease was responsible for the disappearance of vanilla plantations from Mahé Island, the main producing island of the Seychelles at the beginning of this century. Vanilla is now relegated to the islands of Praslin and La Digue, where drier conditions are unfavourable to the fungus. Following the increase in prices of vanilla during recent years, new areas have been planted under vanilla in Mahé.

It remains to be seen whether these new plantations will be immune from anthracnose. To control this disease it is recommended in the Seychelles not to plant vanilla too closely, to avoid excessive shade, to take care not to bruise the vines and to burn affected plants.

Pests

The blackbird, *Ixocincla* (*Hypsipetes*) *crassirostris*, is considered to be an important pest of vanilla in the Seychelles, especially in the hillside plantations. This bird destroys the vanilla flowers by cutting them just above the immature fruits. Depredations, due to this bird, can be serious, amounting sometimes to the destruction of some 25% of the flowers.

Another pest is the giant snail, *Achatina*, which attacks young shoots and young pods. Damage to the latter may result in a produce of inferior quality. Metaldehyde is used against this pest. The Department of Agriculture has recently introduced a predacious snail from East Africa, *Gonaxis quadrilateris* Preston, to prey on the *Achatina* snails.

(to be continued)

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News from Rothamsted

Sir William G. Ogg, M.A., Ph.D., LL.D.

Sir William Ogg, one of the world's foremost soil scientists, retired in September after 15 years as Director of Rothamsted Experimental Station. This year Sir William was awarded the Piria Gold Medal of the Italian Chemical Society at a joint meeting of that body and the Society of Chemical Industry. His successor is Mr. F. C. Bawden, F.R.S., who has been Deputy Director for a number of years.

Technical News

Articles in the December issue of some of the other journals of the Leonard Hill Technical Group include the following:

Atomic World. – ' Nuclear Energy in Sweden '.

Chemical & Process Engineering. – ' New Synthetic Rubber Plant at Hythe '.

Corrosion Technology. – ' Determining the Corrosive Aggressiveness of the Atmosphere ' by N. D. Tomoshov, G. K. Berukshits and A. A. Lokotilov; ' Lead as a Material of Construction for Chemical Plant ' by J. G. Openshaw.

Dairy Engineering. – ' A Year's Progress in Dairy Packaging '; ' Plant Cleaning Routines '.

Food Manufacture. – ' Mushrooms by the Million '; ' The Bacterial Population of Fresh, Healthy Cucumbers ' by Z. Samish and D. Dimant; ' Mechanisation in the Cheese Industry ' by W. G. Wearmouth; ' Some Observations on the Electrical Stunning of Pigs – 2 ' by Sv. Mogens Blomquist; ' The Problem of Improving Nutritive Value, with Special Reference to the Enrichment of Foods – 6 ' by E. Menden and H. D. Cremer.

Photo: Kenya Information Service

Good sucker material for coffee cuttings, Kenya

Planting Coffee in New Areas

A. E. HAARER, F.L.S.*

This is a guide to new planting. The author defines the correct environment for C. arabica *and* C. robusta.

FIRSTLY, it is necessary to decide whether it is wise to plant more coffee at the present time, knowing that there is a growing surplus of coffee in the world, particularly of the milder kinds produced in Central and South America, since demand is not at present keeping pace with supply.

Despite this, prices are still high, averaging nearly £400 per ton for East African Arabian coffee and £275 for Uganda robustas. The price may drop, of course, but it has some way to go before coffee becomes unprofitable, especially since research and modern practice have shown the way to produce 8 and 10 cwt. per annum per acre, rather than the average of 3 cwt. in past years. Though the larger producing countries of the Western Hemisphere are endeavouring to restrict their output and sales, a few thousand tons from a new area would not make much difference, especially when markets can be found in the U.K. or Continental countries.

Peasant people, who grow coffee themselves and have no large overhead expenses to bear, are much more resilient to any period of lower prices. Co-operative societies help to collect, prepare and sell their produce, so that there is less risk in encouraging controlled native production in a new area rather than for a planter himself to risk his all in a new venture.

Curiously enough, the robusta coffees may continue to enjoy a ready sale for the preparation of solvent coffees and be easier to sell during any downward trend than the milder good-quality Arabian coffees. This used not to be the case.

Setting aside the questions of supply and demand, this article attempts to give guidance regarding what to seek for in a new environment which might lead one to suppose that coffee of the Arabian or robusta kinds would grow well and produce good crops.

* Author of *Modern Coffee Production*, Leonard Hill Ltd., 1956, pp. 467, illus., 56*s*.

Rainfall and soil moisture

Above all, it is important to know that the rainfall or the moisture content of the soil would be sufficient. For both types of coffee a rainfall of 75 in. or more is ideal, provided the maximum rainfall does not much exceed 100 in. in any one year. Furthermore, the rainfall should be spread throughout the year with never less than, say, 2 or 3 in. during a dry period of three or four months. A drier period is useful because it helps to influence new growths to initiate flower buds rather than shoot buds at that time, and a season of heavy rainfall encourages the flowers to flush at the beginning of the wetter period.

One must be suspicious of annual rainfall returns and study them month by month, if such returns are available, to discover if the rainfall is erratic, realising that the rainfall may be more or less with each step in altitude or on different aspects of sloping ground. The rainfall on one hillside may be half that on the other, according to the prevailing winds and how the clouds gather, and there may be gaps in the year with no rain at all.

A great deal of coffee is grown successfully in the world with nothing like the rainfall mentioned above. Indeed, in many parts of East Africa the rainfall is not much more than 40 in. per annum. But this is now known to be too little, and every means must be used to conserve moisture by contour cultivation and ridging and by mulching with grass at least once a year.

Mulching

In East Africa, grass is grown on poorer land as near as possible to the coffee. Napier (elephant) grass is usually grown for this purpose and fertilised with chemical manures to ensure a lush growth. A close growth of grass is more likely to absorb most of the chemicals supplied, so it is better to use fertilisers in this way than place them directly on the coffee land. The grass mulch decays and thus provides nutrients properly in balance from the organic material.

A mulch of this sort permits the rainfall to penetrate deeper into the soil, it helps to stop erosion and evaporation and it keeps the topsoil cool. Indeed, mulching, placed on the ground towards the middle of the rainy season, has been found of great benefit in regions of short rainfall, despite the fact that it decays and there may be little left to cover the soil towards the middle of the drier season.

It is not wise to use too deep a mulch, or maintain a mulch all the year round. Though proper mulching almost doubles the yield, alternate row mulching may increase the yield still further when the grass is spread between two lines of coffee. Then half the soil of each line will be mulched and the other half open to the air. One half of the surface feeding roots are then drier, and this appears to influence the trees to initiate more flower buds, sustained as they are by half their roots absorbing sufficient moisture.

A mulch of Napier grass should be wilted before it is laid on the soil, so that it does not strike root from the nodes, and it should be laid across the slope. It is fitting to mention here that robusta coffee requires rather more moisture than is required by the Arabian kind.

Photo: by courtesy of the Belgian Commercial Attaché in London

Robusta coffee tree at Medje in the Province Orientale of the Belgian Congo

Photo : East African Information Service

Seedling beds for coffee. Loose laths are laid on the wire runners to provide shade, according to the intensity of the light

Temperature

Too high a temperature often leads to trouble, especially with Arabian coffee. Arabian coffee requires a temperate but frost-free climate, and it is best if the temperature never goes higher than 75°F. If the temperature goes much higher than this for longish periods, and beyond 80° to 85°F, then the coffee will grow too quickly. It will look surprisingly and deceitfully healthy in its young years and often will bear heavily in its third year. In fact, it will overgrow its strength and overbear, leading to die-back, biennial and triennial cropping, and disaster if the rainfall is short.

It is better if the Arabian coffee grows slowly and becomes hardier, giving its first good crop in the fourth year. The stems and branches grow thick, the leaves a darker green and leathery.

On the other hand, robusta coffee will stand more warmth if the rainfall is sufficient, though a steady day temperature reaching not more than 75°F appears to be ideal. Cold weather, near frost, and strong cold winds are fatal to Arabian coffee, just as dry, hot winds curl up the leaves and throw the trees of both species into a decline. Moderate temperatures throughout the year are ideal for both kinds of coffee, the Arabian coffee doing best under temperate conditions and robusta flourishing in warm summery weather.

Humidity

Both types of coffee grow best in high humidity. Arabian coffee requires cool mists and a fair amount of cloud cover, and if these conditions are available it will grow well without shade. Robusta coffee grows best with humid but warmer conditions – it does not prosper in hot sunshine or dry air, hence an island where there are moist sea breezes and frequent showers of rain is often ideal.

Soil type

The soil must be well drained and never waterlogged. It must be fertile and loamy, so that it holds moisture. A granitic sandy soil is not good for either species unless the rainfall is satisfactory, well spread, and the soil kept covered.

Most authorities state that the soil should be slightly acid, but coffee is often grown successfully on a neutral soil. Alkaline soils would not be suitable.

Ecological associations

One should look at the plant growth and the associations of wild plants in the neighbourhood. Many of the trees should be evergreens with broad leaves and the undergrowth should be shrubby or herbaceous, certainly not thorny. Grass-covered land is generally to be avoided unless the grasses are tall and lush like Napier grass, or highland meadow grass, such as one would find with plenty of mist and rain. Areas of reedy grass are not likely to prove a good site.

Pests and diseases

Diseases of coffee are encouraged by insanitary conditions and they will flourish among wild host plants or on abandoned plantations which have not been properly cleared up.

One must always remember that, if coffee is not given its proper environment, pests and diseases are likely to be more troublesome than usual. Furthermore, a planter must always be forewarned about the possibility of some local pest breaking out because of a biological imbalance. To give just one example: if robusta coffee were planted where the conditions were not ideal – in an area, perhaps, where the sun's heat made it necessary to plant shade – then the bean borer beetle might become disastrously prevalent because the controlling parasites would most probably not be present.

Papaya for Export

Replanting and Other Problems

A. H. LANGE

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ALTHOUGH the future seems bright for the papaya, there are a number of serious problems facing this growing industry. One of these is the delivery of a consistently high-quality fruit to the U.S. mainland markets. The storage life of the papaya is relatively short in comparison with that of such fruits as citrus and apples. When the period in transit is discounted, the storage life of the papaya on the west cost of the U.S.A. is approximately a week.

Storage rots

While commerce waits for a fast, inexpensive means of transportation, which the future will undoubtedly find in nuclear-powered ships, the papaya growers and research workers in Hawaii are working on ways of lengthening the storage life of the papaya.

Special hot water and vapour heat treatments have been developed to reduce storage rots, *Colletotrichum* sp. Other field and laboratory studies with fungicides, waxes and protective coverings are directed at reducing losses due to storage rots, and at improving fruit quality. Breeding experiments have been directed toward the development of firm-fleshed good-keeping fruits.

One of the rapidly expanding fruit industries in Hawaii today is the growing of papaya. Highly esteemed by the island people as a breakfast fruit, the papaya has also been gaining in popularity on the mainland. Exports of this highly nutritious fruit have been steadily increasing over the past 10 *years due to an unlimited market in the U.S.A.*

In order partially to meet the growing demand for more and better fruits, new areas in the Puna section of the island of Hawaii are being developed, as farmers in the older producing areas of Oahu and the other islands are finding it difficult to expand, or to stay in business because of increased costs of production and the difficulty encountered in replanting old papaya land, year after year, to papaya. The common practice has been to ' rest the soil ' or in some other way ' rejuvenate ' it in order to ensure profitable papaya crops. Changing from one cash crop to another is highly undesirable for the farmer, but it is not always possible to establish a satisfactory rotation on farms of small acreage. New land suitable for growing papaya in most of the islands is expensive and not always available.

Nematodes

The Horticulture and Plant Pathology Departments of the Hawaii Agricultural Experiment Station have investigated several approaches to the problem of replanting, the most promising to date being pre-plant soil fumigation. In 1953 Dr. R. A. Hamilton, of the Horticulture Department, on the island of Oahu, obtained a highly significant growth response with the use of Mylone 85W (contains 85% 3,5,-dimethyl-tetrahydro-1,3,5,-2H-thiadiazine-2-thios).

Subsequent work and the response of the pineapple to various soil fumigation practices have indicated that a number of soil fumigants may provide the solution to the problem, but it has further been inferred that the primary cause of the trouble may not always be the same in every problem field.

Rotylenchulus reniformis, a non-gall-forming nematode, has been found associated with papaya roots from many locations in Hawaii. The largest population has been found in several well-drained soils cropped continually to papaya for several years. The number of *Rotylenchulus reniformis* was reduced and striking growth and yield responses of papaya resulted when pre-plant treatments were made with Nemagon (1-2 dibromo-3-chloropropane), D-D (100% 1,3, dichloropropene and 1,2, dichloropropane), Telone (1,3 dichloropropene), Dowfume W-85 (85% ethylene dibromide) and Dowfume MC-2 (98% methyl bromide and 2% chloropicrin). Two months after pre-treatment, large differences could be observed in growth and vigour. Nemagon at 2–4 gal. per acre, injected in well-prepared soil at 6 in. depth and 12 in. spacing, gave the

Young papaya seedlings. Left: *Growing in untreated soil.* Right: *Growing in soil treated with Shell DD at 20 gal. per acre*

Extensive mite damage on the new foliage of a papaya tree

best growth and yield of papaya in these soils. Its long-lasting reduction of nematode numbers was correlated with highest yields for the longest period.

On a poorly drained soil cropped several times to papaya, Nemagon up to 8 gal. per acre and D-D up to 40 gal. per acre were ineffective in producing growth responses, whereas methyl bromide, chloropicrin and vapam gave significant growth responses. Stunted plants of the control and nematocide-treated plots manifested a high incidence of root rot. Several organisms were identified as species of *Phytophthora*, *Fusarium*, *Sclerotium*, *Verticillium* and *Pythium*. Since methyl bromide, chloropicrin and vapam are considered to have considerable fungi-toxic properties, they may have caused greater inhibition of root-rotting fungi than did Nemagon and DD. Strip application of methyl bromide at 182 lb. per acre was most effective in these poorly drained soils.

Mites

A problem somewhat less severe than storage rots and ' replanting ' is the reduction of plant vigour and production brought about by three types of mites. The broad mite, *Hemitarsonemus latus* Banks, a translucent, white-coloured mite, is difficult to see without the aid of a magnifying lens, but its presence can be easily recognised by the characteristic distortion of new foliage. Wettable sulphur at 5 lb. per 100 gal., or a light dusting of sulphur, will give efficient and economical control.

Another troublesome mite, attacking mature trees and fruit, is *Brevipalpus phoenicis* Geijskes. This mite is usually less damaging to the tree than the broad mite, but produces large, unsightly lesions on the fruit. Sulphur at the above recommended dosage gives satisfactory control, if the farmer is alert to the early stages of infestation.

By far the most serious mite problem today is the two-spotted spider mite, *Tetranychus telarius* L., also called red-spider mite, which attacks the foliage usually during warm, dry weather. This mite attacks the underside of leaves, produces webs, and causes chlorosis of the leaves and stunting of the tree. It attacks all ages of plants, from the very young to mature trees, and spreads rapidly.

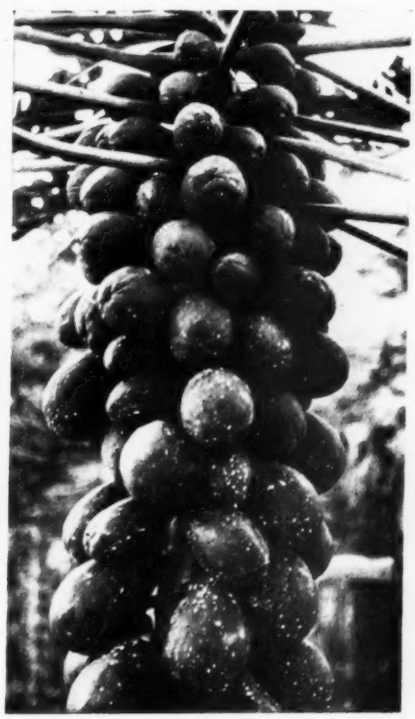
Aramite, 2-(p-tert-butyl-phenoxy) iso-prophyl 2 chloroethyl sulphate, at 1 lb. per 100 gal., has been recommended, but has frequently been found toxic to fruit at concentrations as low as 0.2 lb. per 100 gal. The wettable chlorobenzilate, ethyl 4,4 dichlorobenzilate, has been found to give good control of two-spotted mite, without damage, at $\frac{1}{4}$ lb. of active ingredients per 100 gal. Chlorobenzilate has been cleared by the U.S. Department of Agriculture for many fruit crops, but as yet has not been cleared for fruiting papaya plants and should therefore only be used on those trees not yet producing ripe fruit.

Papaya crop on a tree growing in soil which has not been treated with a fumigant

Right: *Papaya crop on soil which has been fumigated with ' Nemagon ' before replanting*

Fungi

Another major problem facing Hawaii papaya growers is powdery mildew, *Oidium caricae* Noack, a fungus which attacks the underside of leaves of papaya plants of all ages. This disease is most damaging in wet areas and during warm, rainy seasons. Large yellow spots which appear on



the upper surface result from patches of mealy, whitish growth of the fungus on the lower leaf surface. Although it sometimes attacks young fruit, powdery mildew is principally a foliage problem very difficult to control. The hyphae can be killed by frequent sprays of sulphur and tribasic copper sulphate, but further research is necessary to obtain complete control. A number of new experimental materials are being tested in an attempt to control the powdery mildew, as well as anthracnose fruit rot, mentioned in regard to storage rots.

Papaya research at the Hawaii Agricultural Experiment Station is not only concerned with these problems of production, but also with developing new varieties with longer storage life and better fruit quality – all with the object of producing better fruit for export.

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News from Africa

Tobacco in Rhodesia

The average yield per acre on tobacco farms in Southern and North-Western Rhodesia rose sharply last year. The Rhodesian Tobacco Marketing Board estimates that it was 829 lb. per acre, 115 lb. per acre more than the record yield of 714 lb. reached in Southern Rhodesia in the 1953–54 season. Two reasons are given for this sharp rise in yields in the Board's annual report. It was the result of the better growing methods evolved by the Tobacco Research Board and the fact that the season started well.

The main indications are that the crop showed an improvement in body, the percentage of leaf types being the highest for the past six years, while the total production of leaf types at 90,500,000 lb. was nearly double the average production of these types over the past nine years. Despite the disappointing general quality of the crop —it contained a very high proportion of green and nondescript tobacco—it produced some 48 million lb. of top and middle grades. This far exceeds the quantity of these grades available to buyers from any previous crop.

Tea in Tanganyika

Colonial Development Corporation has agreed to subscribe up to £450,000 towards the cost of a tea development scheme being carried out by Bird & Co. (Africa) Ltd. on that company's estates in the Eastern Usambara Mountains of Tanganyika.

It is planned to increase the planted area from 840 acres to 2,700 acres by June 1965 at an estimated overall expenditure of £820,000. This sum will include the cost of a factory capable of dealing annually with about three million pounds of tea.

Hybrid Maize in Southern Rhodesia

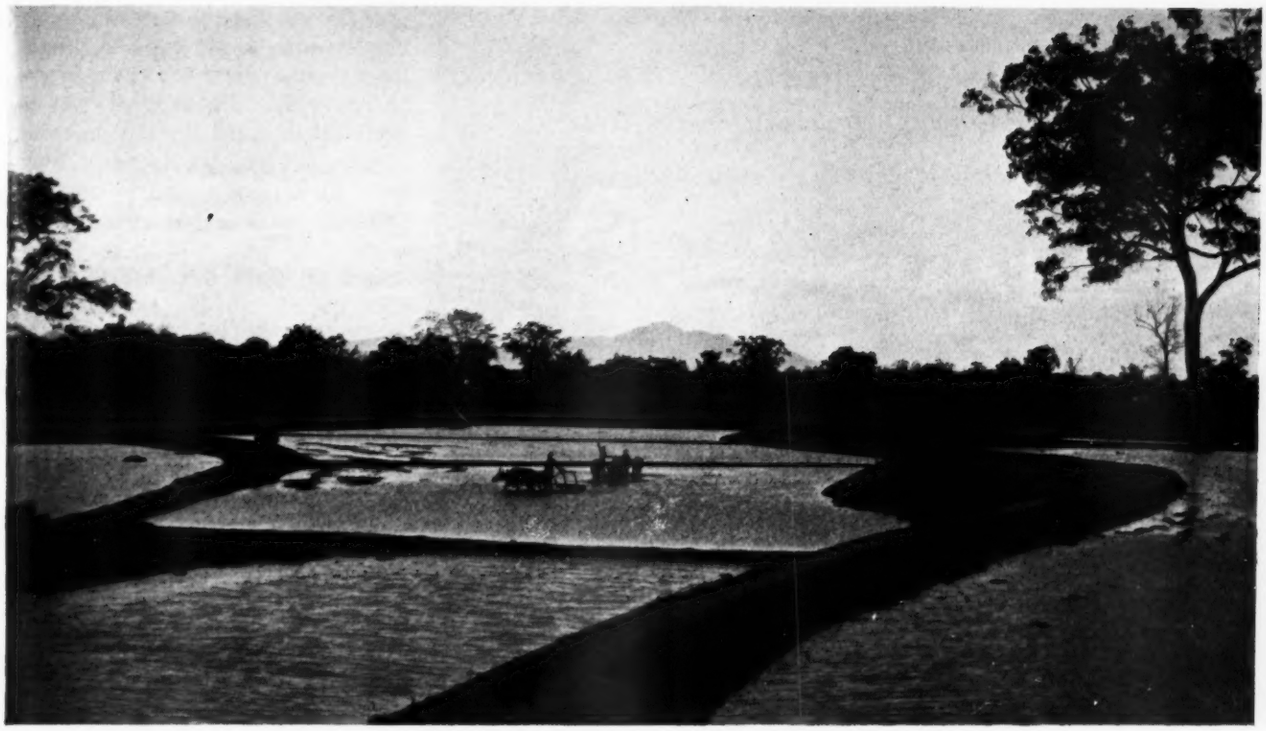
'It is probable that Southern Rhodesia's research services have been paid for by the money saved through the introduction of hybrid maize,' said the Director of Research and Specialist Services. The use of hybrid maize has given greatly increased yields and in past years has reduced appreciably the amount of maize it was necessary to import.

About 75% of the maize in Southern Rhodesia is now being produced from hybrid seed. In certain of the main maize-growing areas the use of hybrid seed is as high as 100% and native growers are also using appreciable quantities. Southern Rhodesia now seems to be entering a period of surpluses, although it is not certain to what extent this is due to a series of good rainfall years or to the use of hybrid seed and the more liberal use of fertilisers, particularly nitrogen. Economic studies have shown that low production costs are closely correlated with high yields per acre and, providing they can produce maize cheaply enough, they should not fear maize surpluses. On an area basis Southern Rhodesia is primarily a pastoral country and with the limitations of its rainfall-produced pastures, because of the long dry season, the use of maize for livestock consumption seems the obvious use for the maize surpluses.

Ghana Goodwill Mission

The Ghana Goodwill and Trade Mission, which visited Coventry this year, was given an official reception by the Lord Mayor, Alderman Pearl M. Hyde. In the course of their tour they paid a visit to the Massey-Ferguson works and subsequently the tractors and implements which they had seen being assembled in the factory were tried out by the members of the Mission at the School of Farm Mechanisation at Stoneleigh Abbey in Warwickshire, where trainees are received from all parts of the world.

An instructor, Mr. G. Lloyd-Jones, rides with Mr. W. M. Q. Halm, of Ghana, as he tries his skill at ploughing



Farmers preparing their fields at Gal Oya, a vast irrigation project in the Eastern Province of Ceylon. The waters are being retained at three levels by earth bunds

The Production and Processing of Rice

An International Approach

R. W. PHILLIPS

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THE area on which rice was grown in 1955 amounted to about 269,843,000 acres, as compared with about 332,114,000 acres of wheat. These are world totals, exclusive of the U.S.S.R., for which no figures are available. Production per unit area is higher for rice than for wheat and these areas yielded 199,100,000 metric tons of paddy and 157,500,000 metric tons of wheat.

In the same year the world's population was 2,691 million or, leaving the U.S.S.R. aside, 2,491 million. Thus, in the area outside the U.S.S.R., the amount of rice produced per person was 176 lb., while the amount of wheat was 139 lb.

It is apparent from these figures that rice ranks high among the world's food crops, both in terms of volume of production and in terms of numbers of people who depend upon it as their chief article of diet. It is, therefore, not surprising that rice has received considerable attention in the Food and Agriculture Organisation of the United Nations.

The Food and Agriculture Organisation of the United Nations believes that modern science and technology, properly applied, can increase rice production from existing areas by 50% and so improve the living standards of the rice-eating peoples of the world.

Countries of production

The importance of the rice crop as a major source of food varies from region to region, and it has assumed greatest importance in many countries where the human population is high and dense, such as Japan, China, India, Pakistan, Ceylon and Indonesia. In fact, a little over 92% of the total yield in 1955 was produced in the Far East. The amount of rice produced per person in that year, in each of the major regions, is shown in Table 1.

These figures give a good indication of the extent to which man is dependent upon rice in each major region. There are, of course, variations within regions. For example, in Europe rice is an important crop only in the southern countries, and the *per capita*

The paddy fields of Java. A typical scene showing the steep hillsides, accurately terraced along the contours

production in Italy and Spain was 17.9 and 13.4 kg., compared with the average figure of 4.2 kg. taking the region as a whole.

Purpose of FAO

FAO, an international organisation now consisting of 77 nations, was established in October 1945 by the 32 countries which accepted its constitution at that time to facilitate action by member nations for the purposes of:

1. Raising levels of nutrition and standards of living of the peoples;
2. Securing improvements in the efficiency of the production and distribution;
3. Bettering the condition of rural populations; and thus
4. Contributing toward an expanding world economy.

What can an international organisation such as FAO (which owns no land upon which rice can be produced and has no control over any farmers who could produce it or over any millers who could process it) do to bring about improvements in either the production or the processing of a crop such as rice, upon which so many people depend?

Mode of operation

The methods used by an international organisation of governments must be such that the organisation assists the member governments in carrying out their own functions most effectively. It is the governments, the governmental and non-governmental research, educational and extension departments and institutions, and the farmers and private industries within each country, that must carry out the work necessary to bring about improvements in any phase of agriculture.

So also with the improvements of rice processing, any action taken by an inter-governmental organisation such as FAO becomes essentially a kind of extension activity or service, with governments rather than farmers or processors being the recipients of the service.

Ten-point approach

The methods used by FAO and their application to problems of rice production and processing are as follows:

1. Technical meetings are held usually on a regional basis, but sometimes on a world-wide basis, in which delegates from countries exchange information and ideas, and in some cases arrange for co-ordinated action on problems of common concern. Such a meeting was held in Calcutta, India, in November 1956 to consider problems of storage and processing of rice (FAO, 1956) under the auspices of the FAO International Rice Commission.

2. Survey missions are sent to study the needs of countries that may request such assistance and to propose programmes for agricultural development.

Among such missions, that to Thailand (FAO, 1948) devoted major attention to the improvement of rice production and marketing, although it did not attempt to deal with technical aspects of the improvement of rice processing. A mission to the Yemen examined the possibilities of expanding rice production in that country.

3. Individual experts, or groups of experts, are sent to countries for varying periods to advise and assist the governments in carrying forward agricultural projects. For example, rice-processing experts have served in Burma, Ceylon, Liberia, Paraguay and Venezuela.

4. Limited amounts of technical supplies, equipment and literature may be provided to enable experts serving in countries to carry forward their activities in an effective manner. For example, special equipment was provided for a pilot rice-processing plant in Liberia.

5. Training centres are held for single countries, or groups of countries, that have common interests, in order to impart knowledge of specific techniques to trainees who will use those techniques to carry forward agricultural development projects. Two regional centres on rice breeding were held in Cuttack, India, and two on the use of fertilisers in rice production in Coimbatore and Hyderabad, India, in 1952 and 1955.

6. Fellowships are provided for study outside the home countries of trainees, primarily as a means of training the technicians and technical leaders who are needed to carry forward projects upon which advisory assistance has been given by experts. Fellowships have been awarded in rice processing to workers in Burma and Liberia.

7. Summaries of new technical findings are published for the guidance of member countries, particularly in planning and implementing projects for economic development. Among those dealing with rice processing are

Table 1
Paddy produced per person

Region	*Kg.*	*Lb.*
Far East ..	131.7	290.3
Latin America ..	32.6	71.9
Africa	17.1	37.7
Near East ..	14.9	32.8
North America	14.0	30.9
Oceania ..	7.1	15.6
Europe ..	4.2	9.3

publications on equipment for the cleaning and grading of grains and seeds (Ray and Beekman, 1951), equipment for the processing of rice (Aten, Faunce and Ray, 1953) and a trilingual glossary of rice-processing machines (Borasio and Gariboldi, 1957)

8. Staff members maintain contact with the agricultural leaders in member countries through visits and correspondence, in order to obtain information and also to supply information and advice. In rural industries rice processing is one of the major interests.

9. Permanent or semi-permanent technical bodies are organised where required to provide the machinery for consultation between countries that have common problems and for the implementation of co-operative action on agreed lines. The FAO International Rice Commission is such a body.

10. Governments are assisted in the preparation and organisation of conventions, which may be required to establish the basis for common action. The International Plant Protection Convention is one example. Through this agreement governments may facilitate their efforts to prevent the spread of various pests and diseases, including those which affect rice, across national borders.

Left:
This photograph shows a few specimens of the rice plants which have been sent in from eight of the countries participating in this project. In these breeding trials 120 thousand crosses have been produced in the patient search for the perfect rice plant

Right:
The purpose of the rice hybridisation project at Cuttack in India is to produce hybrids from the Japonica *and* Indica *varieties of rice. The former grows in temperate regions and the latter grows in tropical countries and does not respond to fertilisers*

Work of the Agriculture Division

Within FAO, technical work aimed at rice improvement is assigned to the Agriculture Division. There are three technical branches concerned directly with assisting governments in the solution of rice production or processing problems:

The *Land and Water Use Branch* is concerned with soil and fertilisation problems, irrigation and drainage, mechanisation of rice culture, farm management and soil-water plant relationships in rice production.

The *Plant Production Branch* gives attention to rice breeding, seed production and distribution, and protection of rice in the field and in storage.

The *Rural Welfare Branch* gives attention to the processing of rice.

Two other branches are concerned with problems having a bearing on rice production. The *Agricultural Institutions and Services Branch* is concerned with the over-all problems of improving government services to agriculture, including research, extension and training of agricultural leaders. The *Animal Production Branch* is concerned with problems of livestock improvement, feeding and protection, all of which are related to rice improvement because of the important place animals have in the rice economy as sources of power and manure.

International Rice Commission

The International Rice Commission formally came into being on 4 January, 1949, in accordance with the terms of the constitution drafted at the FAO Rice Meeting in Baguio, Philippines, in March 1948. The Commission held its first official session in Bangkok, Thailand, 7–16 March, 1949, and 26 member countries are now members.

During the early years of its existence various aspects of rice production and processing were discussed, but concentrated attention was given only to two topics – breeding and fertilisers.

Working Parties

The *Working Party on Rice Breeding* held its first meeting in Rangoon in 1950 and there decided upon the major problems to which it should give attention. It proposed the holding of training centres, recommended the appointment by FAO of a full-time expert on rice breeding, and laid the basis for a rice hybridisation project utilising *Indica* and *Japonica* stocks. There was strong support for the continuation of the Working Party and further meetings were convened in 1951, 1952, 1953, 1954, 1955 and 1957

Rice planted in Brazil

at Bogor, Bandung, Bangkok, Tokyo, Penang and Vercelli, respectively.

These meetings provided opportunities for the exchange of information on many aspects of rice breeding, for joint consideration of certain topics with the Working Party on Fertilisers, and a study at first hand of the work under way in Indonesia, Thailand, Japan, Malaya and Italy. In addition, the two regional training centres were held in India in 1952 and 1955.

The first meeting of the *Working Party on Fertilisers* was held in Bogor in 1951. This was followed by meetings in 1952, 1953, 1954, 1955 and 1957 at Bandung, Bangkok, Tokyo, Penang and Vercelli, a portion of each meeting being held jointly with the Working Party on Rice Breeding.

Specialists from various countries exchanged information on all important aspects of fertiliser and manure experimentation and use, and on the solution of soil fertility problems pertaining to rice culture, and also to see the work under way in the countries where the meetings were held. Particular attention was given during 1953 and subsequent years to experimental designs for response curves. Following a recommendation of the Working Party, FAO held a regional training centre on soil fertility at Coimbatore, India, in 1952 and a second at Hyderabad, India, in 1955.

The intricate and important problem of soil-water-plant relationships in rice production was first discussed by the Commission at its Third Session in Bandung in 1952, and the subject was also considered at the joint meetings of the Working Parties on Rice Breeding and Fertilisers. As a result of these discussions, the Commission, at its Fourth Session in Tokyo, recommended that FAO establish an *ad hoc Working Group on Problems of Soil-Water-Plant Relationships*. The findings of this Working Group are summarised in the report of the Fifth Session of the Commission (FAO, 1956*a*) and indicates clearly the need for much greater attention to this group of problems. A meeting of this Working Group was held jointly with the Working Parties on Rice Breeding and on Fertilisers at Vercelli, Italy, in 1957 (FAO, 1957*a*).

At its first three sessions in 1949, 1950 and 1952 the Commission had only given limited attention to the problems of mechanisation of rice culture, including devices for lifting water for irrigation, hand- and animal-powered equipment and machinery, and motorised equipment for tilling and harvesting. At its Fourth Session, however, the Commission recommended that FAO should set up an *ad hoc Working Group on Problems of Mechanisation of Rice Production* to report on the technical and farm management aspects as a basis for consideration of further action by the Fifth Session.

At its first three sessions the Commission had given some attention to the reduction of losses in rice through improved operational methods, including (*a*) harvesting, drying, storing and handling, (*b*) conventional milling operations and (*c*) parboiling. However, it was not until its Fourth Session in Tokyo that the Commission decided on definite steps in this field.

The Working Group on the Storage and Processing of Rice was established to examine these problems and also to report to the Fifth Session of the Commission. A meeting of this Working Group was held at Calcutta in 1956.

Relatively little has been done by the Commission on the problems of the control of pests and diseases of rice, but following the recommendation of the Fifth Session steps were taken during 1957 to study the possibilities of developing inter-country co-operation.

Summary

The FAO International Rice Commission provides a forum in which representatives of countries may discuss their rice production, storage and processing problems. Under this Commission working parties and groups have given attention to all the major aspects of rice production, storage and processing, except protection of rice in the field, but a start is being made on this problem.

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Ray, Luther R., and Beekman, Evert (1951): 'Equipment for Cleaning and Grading Grains and Seeds', Agricultural Development Paper No. 10, Food and Agriculture Organisation of the United Nations, Rome, Italy.

New Publications

Tea

By T. Eden. Pp. 201, with illustrations (some in colour) and diagrams. London. Longmans, Green and Co. 1958. 35s.

This volume is one of the Tropical Agricultural Series, in which those on rice and on cocoa have already been published, whilst others are in preparation. The author of this book was for many years at St. Coombs Tea Research Station in Ceylon, then in 1949 he went to Kenya as Director of the Tea Research Institute at Kericho, from which post he retired in 1954.

The author describes the various stages of tea cultivation and processing, on which he bases a discussion of the principles involved.

The chemistry of the tea leaf and of tea manufacture is adequately dealt with, as well as the factor of quality, a subject so far baffling to chemists. The question of non-wither teas is also discussed.

From wide experience in two contrasted regions – Ceylon and East Africa – he concludes there is no single or exclusive way of growing tea well. Scientists working in the tea plantation industry will agree with this conclusion, but there will be many who will disagree with some of the field practices in Ceylon. As recently as 1957 the methods of cultivation and bush treatment which distinguished Ceylon from other tea-growing countries were severely criticised by St. Coombs and no doubt field operations there will move more into line with those developed over the years in India. Countries establishing tea as a new industry would do well to follow the field methods of India, adapted as necessary, rather than those of Ceylon.

The subject of the incidence and control of pests and diseases is amply dealt with and well illustrated. This treatment forms a large part of the book and many valuable and interesting observations are made.

There is an account of the tea trade, together with apt and ample references, to complete a most readable book, which is a valuable addition to the literature on tea and tea production.

C. R. HARLER

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Diseases of Rice

Doencas do Arroz. By M. V. e Silva. Pp. 164. Lisbon. Ministerio da Economia. 1958. Price not stated.

This work deals principally with diseases of parasitic and physiological origin affecting rice production in Portugal and the methods used to control or eliminate them. A special study has been made of the principal abnormalities caused by the lack of proper nutrition due to deficiency of nitrogen, phosphorus, potassium, iron, calcium, magnesium, manganese, boron, copper, zinc, molybdenum, sulphur or silicon.

There is also a chapter on the disease symptoms caused by the attack of insects and by unfavourable soil and climatic conditions. The generic weakness of certain varieties is dealt with in the chapter on 'braca' or empty ears, which is a common symptom of great economic importance in rice growing. There is also a list of the varieties which are resistant to the principal parasitic diseases.

The Need for Nitrogen

Le Besoin Azote. By R. Jacquot and M. Vigneron. Pp. 269. Paris. Société de Chimie Organique et Biologique.

This volume is Part 2 of a series of four publications entitled 'Amino Acides, Peptides et Protéines'. The co-authors are respectively Director of the Biochemical Laboratories of the National Centre for Scientific Research and Director of Biological Research for the A.E.C. Organisation.

The need for nitrogen is a fundamental requirement of every living being, and one which is not adequately satisfied. The introduction outlines the scope of the subject and emphasises the urgency of the problem.

Nitrogen requirements may be expressed both quantitatively (chapter II) or qualitatively (chapter III). Quantitatively in terms relating to specific physiological conditions – minimum requirements and the requirements for maintenance, growth, gestation, lactation or laying; qualitatively they are determined by the degrees and limitations of digestibility and the rate of assimilation, and the amino acid balance (chapter IV).

Protein efficiency depends on the various phases of metabolism, and the successive processes of protein conversion are described (chapter V). The authors deal at length with the role of D-amino acids, which are today known to be very widely distributed in micro-organisms and animal and vegetable tissues.

Tropical Agriculture

A Notebook of Tropical Agriculture. Sixth edition. Compiled by R. Cecil Wood. Edited by A. B. Killick. Pp. 256. The Imperial College of Tropical Agriculture, Trinidad, B.W.I., 1957. Price 12*s.* 6*d.* or $3.00.

This is a useful book of reference which should be on the bookshelf of farmers, horticulturists, food manufacturers and agricultural institutions.

Long Ashton

The Annual Report of Long Ashton Research Station for 1957 contains an index showing the tremendous volume of research accomplished during the past five years by this Institute under the direction of the late Director, Prof. T. Wallace. It also records the appointment of Prof. H. G. H. Kearns to succeed him.

The report takes the form of 22 original papers by various authors, together with a summary of the work done during the year under review.

There are records of the yields over a 10-year period of Cox and Winston apples grown under intensive and extensive planting systems; tests of a number of iron chelates for the correction of lime-induced chlorosis; and details of the experiments on spraying and the examination of spray supplements. Work on cider includes studies of yeast flora and the effect of fruit maturity on juice composition. The A.R.C. Unit of Plant Nutrition has examined the molybdenum nutrition of higher plants, the nitrogen metabolism of the fungus *Neurospora crassa*, the part played by micro-nutrients in fungal enzyme systems and the effects of the nutrient status on the magnesium and iron compounds in leaves.

H.M.S.O.

Output and Utilisation of Farm Produce in the United Kingdom, 1946–47 *to* 1955–56. This report gives statistical details of the quantity and value of farm output, the utilisation of farm produce and expenditure on fertilisers. It is interesting that, while the area under cultivation declined from its high war-time level, yields per acre of all cereals, potatoes and sugar-beet improved during the past decade. Price 4*s.* 6*d.*

Agricultural and Food Statistics. Guides to Official Sources No. 4, 1958. This guide gives statistics on the Factors of Production (land, labour, capital and organisation); Agricultural Inputs (gross production and output, including prices and subsidies, costs and incomes); Food Supply; Distribution and Rationing: Consumption; Nutrition; and Aggregate Expenditure on Food. Price 4*s.* 6*d.*

Annual Reports

East African Agriculture and Forestry Research Organisation. Record of research for the period 1 July to 31 December, 1957, and Annual Report, 1957.

Twenty-Sixth Annual Report of the Minister for Agriculture, Ireland, 1956–57. From Government Publications Sale Office, G.P.O. Arcade, Dublin. Price 7*s.* 6*d.*

Annual Report, 1957, *of the Department of Hop Research, Wye College.* Pp. 159. From the Secretary, Wye College, Ashford, Kent. Price 5*s.*

Annual Report for 1957 *of the Pea Growing Research Organisation Ltd.* From the Secretary, Pea Research Station, Yaxley, Peterborough. Price 1*s.* 6*d.*, post free.

International Institute of Land Reclamation and Improvement

The Augur Hole Method – Bulletin 1. By F. J. van Beers. Pp. 32. Wagenin, Netherlands. 1958. $0.60, or 4*s.* 3*d.*

The augur-hole method is a rapid, simple and reliable method for measuring the hydraulic conductivity of soil below the water table. It is mostly used in connection with the design of drainage systems in waterlogged land and in canal seepage investigations. The principle is simple: a hole is bored into the soil to a certain depth below the water table. When equilibrium is reached with the surrounding groundwater a part of the water in the hole is removed. The water seeps back again and the rate at which it rises is measured and is then converted by a formula to give the hydraulic conductivity (k) for that soil.

Physical Planning in Connection with Land Reclamation and Improvement – Publication 1. By A. P. Takes. Pp. 79. Wagenin, Netherlands. 1958. $1.25, or 8*s.* 9*d.*

The designing and execution of land reclamation and improvement projects involves a wide variety of operations – civil engineering work, agricultural operations and social organisation. The scope of this publication is limited to the last, and covers water management and usage; surface and sprinkler irrigation; prevention of pollution and salinisation; the allocation of the reclaimed land; settlement and transport problems; recreation and welfare.

Subirrigation in the Zuiderzee Polders – Publication 2. By C. Kalisvaart. Pp. 55. Wagenin, Netherlands. 1958. $0.75, or 5*s.* 5*d.*

The climate and topography in the Netherlands are such that drainage has traditionally formed the main element in the water control of agricultural land, particularly in winter, when the rainfall always exceeds evaporation; in the summer the reverse holds. An artificial supply of water is required during the growing season, only in the case of land of low moisture-holding capacity. Thus in some of the new polders, which are situated some 16 ft. below sea level, drainage is a prime necessity, but it is also necessary to supply water to drought-sensitive soils during the summer. Irrigation conditions are favourable, since it is only a matter of letting in water from the Yssel Lake, which is at a higher level and so lends itself to gravity irrigation. Subirrigation is defined as drainage in reverse. By supplying water and maintaining a given ditch water level the water is made to infiltrate into the soil and so provide sufficient moisture for the crop. Whether subirrigation is possible and the method of its execution depends chiefly on the permeability of the soil. This is the subject of this research paper.

Atoll Research Bulletin

Reports Nos. 59 and 60 on the Gilbert Islands, issued by the Pacific Science Board, National Research Council, Washington, D.C., 1957. Although these are reports on the Gilbert Islands, they are of interest to coconut planters in other parts of the world, as they describe the life of farmers on coral islands, production, the soils on which coconuts are grown and the correct methods of cultivation under these conditions.

Miscellaneous Publications

Pest Infestation Research Report, 1957. H.M.S.O., London. 5*s.* 5*d.*

Insects and Mites in Farm-stored Grain. Adv. Leaflet 368. H.M.S.O. 5*d.* post free.

Grain Driers. Farm Machinery Leaflet No. 4. H.M.S.O. 8*d.*, post free.

Greenhouse Vegetable Production in Ontario, Bulletin 526, and *Sweet Potatoes*, Circular No. 327. 1958. Ontario Department of Agriculture, Canada.

The Handling, Pre-cooling, Transport and Storage of Strawberries and Raspberries. By W. H. Smith. 1958. London. C.S.I.R.O. Free.

Genetics and the Improvement of Tropical Crops. Lecture by Sir Joseph Hutchinson. 1958. London, Cambridge University Press. 3*s.* 6*d.*

Varieties of Lucerne, *Varieties of Sugar-beets* and *Varieties of Swedes.* Farmers' Leaflets Nos. 4, 5 and 7. 1958. Cambridge. National Institute of Agricultural Botany. Free.

Factors Affecting Apple Yields. Circular 122. 1958. Auburn, Alabama Polytechnic Institute, U.S.A.

The Versatile Land Rover

Exhibition of Approved Implements

THE introduction of a hydraulic lift and 3-point linkage has opened up a wide variety of new uses for the *Land Rover*, and its versatility has been further enhanced by the provision of three p.t.-o. points – front, rear and centre. This company recently staged an exhibition of approved implements and accessories to demonstrate the very wide variety of duties that this robust farm and estate vehicle is now able to perform.

The new rear-mounted hydraulic lift and 3-point linkage was demonstrated by the *Adrolic Engineering Co. Ltd.* When not in use the top link, drag chains and cylinder can be removed in a few moments, and the complete unit can be taken off simply by withdrawing four bolts, so that the 'Land Rover' can be used for ordinary transport duties.

The hydraulic p.t.-o. – the key to the versatility of the 'Land Rover' – is by *Dowty Hydraulics Ltd.* The pressure-balanced pumps allow working pressures of up to 2,500 lb./sq. in. and, if motors are fitted, provide outputs of up to 25 b.h.p. at 1,500 r.p.m.

A portable welding unit, 140 d.c., has been designed by the *Lincoln Electric Co. Ltd.* for attachment to the rear p.t.-o. of the Rover so that farmers and estate superintendents in remote areas will now be able to carry out emergency repairs without losing valuable time in rush periods.

The Allman 'Plantector' Model 60 field sprayer mounted on the 'Land Rover'

'Land Rovers' can be fitted with *Wakefield Lubrequipment* to provide a complete mobile high-pressure lubrication service for tractors, earth-moving and harvesting vehicles, operating at some distance away from their central servicing depots, thus avoiding the inconvenience, lost time, and expense of withdrawing this equipment from service.

The standard *Allman* 'Plantector', Model 60, field sprayer has been specially adapted for use with the 'Land Rover'. The 60-gal. tank is carried in the body of the vehicle and the folding boom spray is on a special steel frame in the rear. The spray pump is direct driven from the centre p.t.-o. The 'Universal' Model 100, with a larger spray tank and designed for high-, medium- and low-volume spraying, has a forward-mounted double arm boom sprayer. Both models are controlled from the dashboard in the driver's cabin.

The *John Allen* mechanical shovel is a highly mobile attachment, which has been designed to fill the gap between hand labour and the large crawler-mounted excavator. It will dig trenches up to 24 in. wide, down to 8 ft. 6 in. deep, and will raise the material up to 12 ft. 9 in., and so could be used for bund making and drainage work on coastal coconut plantations. The 'Land Rover' can be detached for other work in five minutes.

F. Mitchell Ltd. produce two models of gang-mowers for towing behind the 'Land Rover' – the 'Dreadnought 3' and the 'Dreadnought 5'. Each mower has a cutting width of 30 in. and they are flexibly attached to the vehicle in gangs of three or five, giving a cutting width of 7 ft. and 11 ft. 6 in., respectively. They can be quickly attached or removed, so that the vehicle is available for other work.

The new Mk. III *Silorator* forage

The Allen 'Rover'-operated shovel digging a drainage trench

The Edwards air compressor, which operates from the p.t.-o., can be used to inflate tyres or to operate a spray gun

harvester can be towed by a 'Land Rover' and driven by its p.t.-o. This machine cuts, picks up, lacerates and loads the crop, all in one operation. The lacerating action ensures a rapid lactic fermentation and ensures the production of high-grade silage.

Snow plough and angle-dozer fitments will be of interest to those living in cold countries and for those who require to do road grading, bench terracing, bunding and minor earthworks on a limited scale, *e.g.* tea planters, coffee growers, foresters and farmers living in areas where the conservation of water for irrigation is essential. The 'Dale' blades, manufactured by *J. B. Howie*, can be fitted or detached in 5 min. and can be worked either straight, or angled right or left.

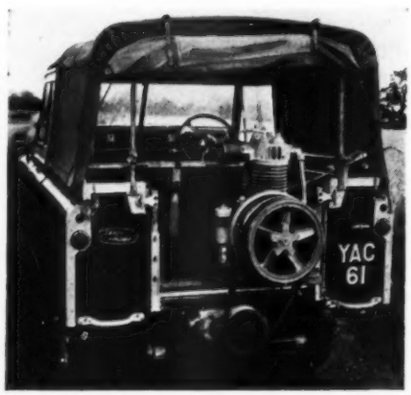
Self-recovery, *i.e.* the ability to get out of awkward situations, is a valuable addition to the cross-country potential. The *Rover* winch unit, which is forward-mounted, is driven direct through a 40:1 gearbox by a hydraulic motor. Power to the motor is supplied by oil under pressure from a pump, driven by the centre p.t.-o. Maximum pull is 4,000 lb., or nearly two tons – useful for minor haulage operations and salvaging other stranded vehicles.

For large-scale field operations it is desirable to maintain control by two-way communication, *e.g.* the collection of mechanically-harvested fruit and corn, without lost time. This is ensured by the prompt removal of the bags of corn or boxes of fruit by lorries, which can be properly directed to the required point by radio control. *Pye* mobile radio equipment has a range of between 30 and 500 miles, depending on the method of operation.

For those living in remote areas and dependent on batteries for power and lighting, the *Rover* charging equipment is just the thing. The system has a separate circuit quite independent of that of the 'Land Rover' and is fitted with radio-suppressed voltage control.

The small air compressor by *Lawrence Edwards & Co.* is a most useful accessory for anti-malarial operations, whitewashing dairies, spray-painting buildings or spray-oiling agricultural machinery before putting it away for the winter. It has an output of 3 cu. ft./min. at 200 lb./sq. in., is easily fitted to the p.t.-o., and can be used for inflating the tyres of farm vehicles.

The *B.E.N./Rover* unit – a much larger machine – is belt driven from



A new air compressor unit, produced jointly by B.E.N. Patents Ltd. and the Rover Co. Ltd.

the rear p.t.-o. and can deliver 38 cu. ft./min. at a pressure of 100 lb./sq. in. There is thus ample power for a wide variety of duties, including drilling, grinding, hedge cutting, spray-painting, wire brushing etc.

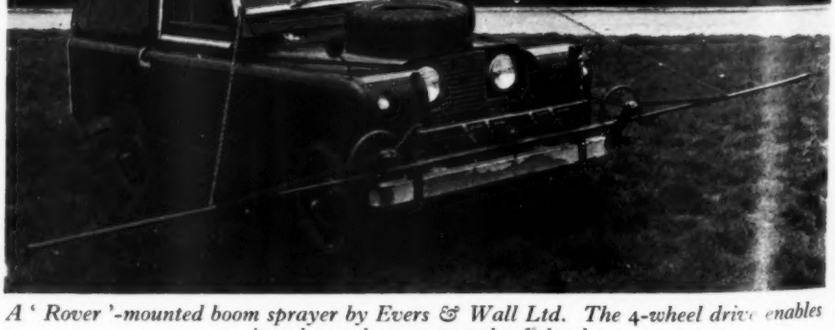
A still larger compressor by *Atlas Copco*, which can deliver 110 cu. ft./min. at a pressure of 100 lb./sq. in., can be used to operate their pneumatic tools, to drill and break concrete, pump water, cut timber and carry out large-scale spraying operations.

The *Simon* hydraulic platform is described by its makers as the machine with a thousand uses. The smallest model, the L 25, can be centre-mounted in the body of a 'Land Rover'. It consists of two hinged lightweight booms, which lift a small working platform from ground level to a height of 25 ft. The necessary power is obtained from the p.t.-o. of the vehicle. Possible uses in agriculture that occur to us are pruning, pollinating, spraying and harvesting operations for all tree crops.

A small hydraulic gear-type pump by the *Rover Co.* has a range of from $2\frac{1}{2}$ g.p.m. to $8\frac{1}{2}$ g.p.m. at 1,750 lb./sq. in. and can be mounted in place of the normal centre p.t.-o.

A *Salopian* 'Rover'-drawn manure spreader has been specially designed for the farmer who does not possess a tractor with a p.t.-o. It weighs only 15 cwt. unloaded and yet has a carrying capacity of 25–30 cwt. The machine, which is actuated from the rear p.t.-o., will shred and distribute farmyard manure, quickly and evenly, even in arduous working conditions.

The 'Swipe' is a rotary slasher, manufactured by *Wolseley Engineering Ltd.*, which can be drawn behind and powered by a 'Rover', and used for pulverising brussels sprouts stalks, kale stalks, mustard, high stubble and pineapple plants before ploughing them in, for reclaiming land by chopping up brambles, bracken, thistles



A 'Rover'-mounted boom sprayer by Evers & Wall Ltd. The 4-wheel drive enables it to be used on steep and soft land

and low-growing brushwood, or it can be used to remove potato haulms before harvesting the crop.

The ' All-work ' sawbench has been introduced by *F. W. McConnel Ltd.* to meet the demand for a sawbench for attachment to the rear p.t.-o., which will do a farmer's, planter's, or field contractor's normal sawing, both ripping lengthwise and cross-cutting any length without harming the vehicle.

The ' Film-Rover ' is a mobile film unit, produced by *British Films Ltd.*, for overseas operation. It is robust, fully tropicalised and completely self-contained, and can be taken to remote regions where dust and rough tracks are substitutes for roads. From brackets mounted on the reinforced roof of the vehicle the screen is mounted and secured, with two loud-speakers on either side. The projector is set up 40–50 ft. from the screen and so it is possible to show films to many hundreds at night time in the open air. When barriers of language and dialect must be overcome, this unit will have many uses for sales promotion, propaganda and agricultural education.

A portable pneumatic power saw – the C.P.-Danarm – by *J. Clubley Armstrong Danarm Ltd.* is a 3-h.p. machine, powered by a ' Consolidated Pneumatic ' air compressor, which will give from 80–100 lb./sq. in. airline pressure and is driven from the rear p.t.-o.

Price's (Earl Shilton) Ltd. produce a 15-kW generator installation for the ' Land Rover ', and *Wolf Tools Ltd.* a wide range of electrically-operated tools and special equipment to provide a complete workshop for the farmer, forester and planter, living in remote places, who need to do their own maintenance and repairs.

Damage to crops by large traction tyres is virtually eliminated by the 4-wheel drive, lower body weight and smaller tyres of the *Evers & Wall* ' Rover ' spraying unit, and it can operate on the steepest land. Spraying can be carried out at up to 10 m.p.h., so making it possible to spray 80–90 acres in a day. The booms are adjustable for various heights of crop. This company has also produced an exhaust nozzle sprayer for the control of desert locust. The special nozzle amplifies the velocity of the exhaust gases from the engine and projects atomised particles of concentrated insecticide into the air over the swarming locusts.

The ' Rover '-drawn Hayter rotary grass cutter provides an easy and economical means of grassland improvement and reclamation

The ' Camel ' trailer tank hauls liquid and freight simultaneously. There are three models with different liquid/solid capacities. It can be used to carry pumps, hoses, brooms and foam-making equipment and also the essential water for fire-fighting; on the farm or estate it will have many uses: for carrying water and hay, fuel and implements, liquid and solid chemicals, liquid insecticides and pumping equipment etc. It is produced by *M. F. Robertshaw Ltd.*

The ' Rover '-towed Camel trailer is fitted with a pump and lance unit for mosquito, plant pest and weed control

R. A. Lister Ltd. were exhibiting a sheep-shearing set for use with the ' Rover '. It comprises two flexible drives and handpieces fitted with standard combs and cutters, powered from the rear p.t.-o.

The *Hayter* ' 6/14 ' rotary grass cutter can also be drawn behind and powered by the ' Rover '. It has been specifically designed for neglected grassland reclamation and improvement. Basically the machine has a 6-ft. width of cut, but this can be increased by wing extensions to give cutting widths of 10 ft. and 14 ft. For movement along roads, these wing extensions can be swivelled back to give an overall width of 10 ft.

Ernest A. Webb Ltd. produce a fertiliser distributor for mounting on the 3-point linkage, which is driven by the rear p.t.-o. A 3-cwt. hopper feeds the granular fertiliser into a horizontal rotating disk and a shroud adjusts the rate of distribution.

The ' Tomkin ' postmaster, which is attached to the hydraulic lift and powered from the rear p.t.-o., has been designed for the speedy insertion of fence posts into the ground. The posts need no pointing and can be driven in, in a few seconds or a few minutes, according to the size of the post and the soil type. The makers are the *Swindon Mfg. Services Ltd.*

Transplanters Ltd. ' Robot ' post-hole digger can be similarly mounted. This makes a useful implement for fencing and tree planting. On coconut estates it will provide a labour-saving method for the burying of coconut husks. It will dig to a maximum depth of 3 ft., and the standard augers are 4 in., 6 in. or 9 in. There is also a special auger for plantation work which will make 18-in. holes 24 in. deep.

Allan Fuller Ltd. manufacture a manure and sludge distributor for mounting on the vehicle. The tank is filled by a vacuum pump and the material is spread by a semi-circular plate.

The *Holt* 3-gang bracken breaker is an implement for the control and eradication of bracken, thistles and other perennial weeds in pastures and ranches, which is drawn behind the 'Rover'. Each crusher section has a solid steel core to which are welded four steel blades with specially hardened edges. On trailing, the sections revolve and the weight of each presses down on the weed growth, which is severed or lacerated by the sharp edges of the knives.

The *Rover Company* offer the 15-cwt. 'Brockhouse' box trailer. It is strongly constructed of steel, but is light in weight and can be quickly and easily detached. Its wheels are interchangeable with those of the 'Land Rover'.

The '*Autometric*' centrifugal pump, which is operated directly from the rear p.t.-o. will deliver 7,000 g.p.h. at 10-ft. head and up to 2,700 g.p.h. at 40-ft. head, or 2,500 g.p.h. against a head of 50 ft. It can be used for pumping storage water, for irrigation and for transferring sludges and suspensions.

Feeny & Johnson Ltd. are the manufacturers of vacuum-controlled trailer brakes for use with the diesel-engined 'Land Rover'. The trailer coupling is quickly detachable and there is dual control.

N.I.A.B.

The Challenge of the Unknown

Addressing the Fellows of the National Institute of Agricultural Botany at Cambridge, England, in July, Prof. M. McG. Cooper, of the University of Durham, had some interesting remarks to make on the subject of agricultural research.

The main purpose of a research establishment, he said, is to do research, not to make a profit. It may be necessary to carry investigations to disastrous extremes to obtain essential information, and so lose money. A scientist cannot serve two masters – research and commerce. The business side of farming, he considered, is best taught by the farmers themselves.

What was wanted in research was a constructive and critical approach to a problem – not the mere collection of masses of facts and figures. A vigorous research programme will bring the scientist to the fringe of knowledge and so to the challenge of the unknown. Today, more and more, research is becoming a combined operation.

Thus the testing of different grasses is not a matter for the plant breeder alone – it is not merely a matter of agronomic characteristics, but also a question of palatability. We do not yet know whether one grass is better than another for producing more meat and milk. A grass may have excellent characteristics – drought resistance, aftermath and yield of dry matter – but if it is unpalatable it will need to be supplemented by the liberal use of concentrates.

Testing work to combine good agronomic characters with palatability is, however, expensive and it may be necessary to abandon the system of randomised blocks in favour of the farmlet concept. This is really the only practical approach to this complicated problem.

New Spraying Technique

Farmers in New South Wales, where extensive irrigation is practised, have made a successful modification of the standard irrigation spray - line system.

The modification consists in fitting the spray nozzles to portable tripods and connecting them to the spray-lines by long lengths of plastic hose. The portable spray nozzles can be moved to several different positions without having to move the spray-line and a man can move the portable heads in less than half the time it takes three men to move a similar length of spray-line. An obvious advantage is that fewer spray-lines, a costly item, were needed.

Trials with these plastic hoses showed that there was practically no loss of pressure at 100 ft. In fact, only 2 lb. pressure was lost in 300 ft., the longest length of hose at present available.

Improved Yields from Rice

The International Rice Commission has recommended that a number of rice-growing countries could improve their average rice yields by reducing the number of varieties cultivated.

The latest report showed concern at the excessively large number of rice varieties still in cultivation in many countries and urged that low-yielding varieties be eliminated. It was also reported that rice of the *Indica* variety normally grown in tropical climates has shown, in recent experiments, a high response to fertilisers; it had previously been believed that this was a characteristic only of the *Japonica* group normally grown in more temperate climates.

The Commission re-elected for another year its chairman, Sri Panjabrao Shamrao Desmukh, Indian Minister of Co-operation; with Mr. Clifford Stuart Christian of the C.S.I.R.O. and Truong Van Hieu of Viet Nam as vice-chairmen.

Another Crop Research Station

A Spices Research Station is shortly to be established at Coorg (Mysore) under the auspices of the Indian Central Spices and Cashew Nut Committee. The station will maintain a world collection of spices of commercial and scientific value. Other plans include a survey of the spice-growing areas of India and the implementation of appropriate crop improvement programmes including investigations into the use of fertilisers, hybridisation, pest and disease control.

Coorg was selected as the site for the new research station in view of its proximity to the existing spice-growing areas of Mysore, Madras and Kerala, which all lie adjacent to one another in south-west India. Furthermore, large areas of the Malnad region surrounding Coorg, at present unexploited, would provide the opportunity for a rapid application of the results of research and a considerable expansion of the present area under spice crops.

Machinery and Equipment

Crop-drying

There are 'American' drying units for all crops – a large tower unit for wheat, barley, maize, rice and other grains, other types for drying coffee, cocoa, tobacco, sisal, lumber, hides and other products. Their simplicity and rugged construction make them suitable for use in remote areas, and as they are designed with a wide range of fuel and power combinations and for low-cost operation they have proved acceptable for Government aid programmes. Special furnaces are available for using waste products as fuel.

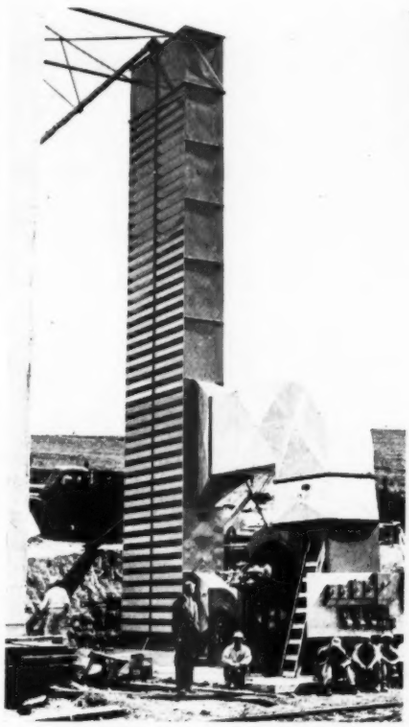
American Drying Systems Inc., of U.S.A., are manufacturers of drying equipment, with world-wide ramifications.

Cotton Planting

Cotton was planted on an experimental farm at Meltham, Yorkshire, in the course of an unusual demonstration, the purpose of which was to test the latest *David Brown* 'Russell' cotton planter, manufactured by *Russell's (Kirbymoorside) Ltd.*

Because of its light and fluffy texture, cotton seed is frequently treated with acid, an expensive process which removes the lint ('fluff') from the seed and enables it to be planted more easily and accurately. In field tests, carried out mostly in the Sudan, this new machine has proved satisfactory for planting the seed in its original undelinted (*i.e.* fluffy) state.

This problem of separating the seeds from the lint and planting them accurately was solved by the use of a special picker wheel, which separates the individual seeds and passes them through a spring-loaded gate to the ground via a coulter pipe. The machine sows at the required rate of four or five seeds per drop. Row widths and spacings are adjustable.



A large 'American' drying unit for all kinds of grain. Note also the use of the Mayrath conveyor

Representatives of David Brown Ltd. and Russell's (Kirbymoorside Ltd.) discussing the mechanism of the new cotton planter with Monsieur L. Ernenst, of Colocoton Ltd. (centre), *a firm operating in the Belgian Congo*

Each of the two seeder units is mounted independently on a David Brown 'Albion' toolbar, which fits all three-point linkages, and the complete outfit is driven by a landwheel. The planter can be quickly converted for sowing most types of seed, including maize, groundnuts, sorghum etc.

Side-mounted Mower

A new heavy-duty side-mounted mower that operates with the cutter bar working horizontally, or raised or depressed 45° above or below the horizontal has been announced by *International Harvester Export Co.* for International 300 and 350 Utility tractors. With side-mounting, the entire cutter bar is always in direct view of the operator so that he can avoid obstructions or adjust the cutter bar.

As the mower is designed to operate with the cutter bar raised above or lowered below the horizontal, it is especially suitable for cutting along steep banks, bunds, ditches, roadsides or rolling pastures with little more strain than mowing a level hayfield.

The new McCormick International No. 23 side-mounted mower will handle almost any heavy-duty mowing job from level hayfields to roadside verges, ditch banks or pastures

A handy lever adjusts the height of the inner end of the cutter up to 9 in. to mow terraces, with the tractor at a lower level.

The mower is powered by a quiet-running V-belt drive from the tractor's p.t.-o. and the cutter bar is adjusted to any cutting height or raised for transport by the tractor's 'Hydra-Touch' hydraulic system. A 5-ft. cutter bar with 3-in. spaced guards is standard, but a special 7-ft. bar and special mower guards are also available.

Other features of the new mower include a safety breakaway, a cable stop to keep the cutter bar from swinging back against the tractor tyre, and full safety-shielding to protect the operator.

Hopper and Sieve

A new intake sieve is being manufactured by *W. S. Barron & Son Ltd.* It takes the form of a combined hopper and screen, which can be incorporated in various installations. Bars attached to a rocker arm sweep the complete screen area, ensuring a free flow of material through the screen at all times. All bag ties and oversize materials etc. are prevented from passing into the processing equipment and can be readily removed on shut-down.

The standard unit with a 5-h.p. motor can handle 15 tons per hour.

Spray Drift Prevention

A useful device for applying weed-killer between rows of plants, between crops and along the edges of lawns or flower beds without the chemical coming into contact with the crop or plant foliage has just been announced by the *Kestrel Engineering Co. Ltd.*

It is a protecting hood which is attached to the spray lance, used in conjunction with their knapsack sprayer, and this is wheeled between the rows of plants or along the edge of the lawn. The oval-shaped shield gently pushes aside the foliage, while the spray is directed straight down on to the weeds. Any spray which is caught by the shield is collected in a small trough running round its bottom inside edge, and this drains out in the centre of the row, where it can do no harm.

Shields can also be supplied for mounting in gangs along the booms of tractor-drawn spraying machines, or they can be made wider for special purposes.

The 'Kestrel' wheeled hood is a useful device for the prevention of spray drift

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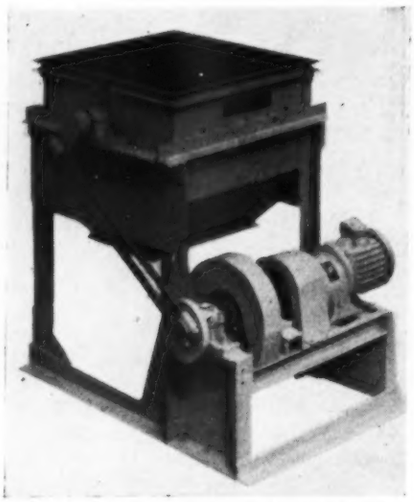

The Barron hopper and sieve combination

The Shawnee 'Claw' is a mechanical grab for loading sugar-cane on to lorries and trailers

Loading Sugar-cane

Shawnee Manufacturing Co. has developed a new streamlined cane loader – the 'Claw' – to fit a wide range of wheeled tractors. This machine allows both front loading and side dumping and it combines stability, lightness and strength with mobility. It can be removed in a few minutes to release the tractor for other work and at all times the rear of the tractor can take other implements. It is designed for large-scale operations, but its manoeuvrability and hydraulic counterweight also make it possible to use it in small sloping fields and in awkward places.

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LH/EW/XMAS

November 1958.

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Agricultural Chemicals

Products for Combating Wind Erosion and the Creeping Menace of Couch

Insecticidal Spray and Dip

'Murtox' emulsion is a product manufactured by the *Murphy Chemical Co. Ltd.* either for spraying economic crops or for use as a cattle dip. It is an emulsion in water, containing 50% toxaphene, which has excellent suspension qualities and can be mixed with water and other spray material.

It has been used to control the two major pests of cotton – the Bollworm and the Boll Weevil – and also Leaf Worms, Cutworm, Army Worms, Leaf Hoppers, Stink Bugs, Cotton Stainer and Thrips. It will not control Red Spider entirely, but it will kill a proportion of the adults.

'Murtox' will control Aphids, Leaf-eating Caterpillars, Capsid, Bud Worm and Grasshoppers on tobacco and it is also used for treating cigar-wrapper leaf, as it has no phytocidal action on the crop.

It has given satisfactory control of Chafer Beetles, Codlin Moth and Apple Sawfly and reasonable control of Aphids on fruit crops, though it should not be applied to certain varieties of plums. It is also recommended for a number of pests of sugar-beet and is worth trying for the control of Stink Bugs on wheat and Caterpillars on maize.

Wind Erosion

Because of wind erosion, extensive areas of the earth have been lost to agriculture, *e.g.* the 'dust bowl' of Arizona, the sandy lands of New Zealand, and the creeping invasion by the desert in parts of Australia. In the Netherlands, too, soil-blowing has been causing serious damage to reclaimed fen, with the production of dunes and extensive sandy areas of no agricultural value.

As a result of research carried out in the laboratories of *W. A. Scholten Chemische Fabriken N.V.*, a product, known as 'Stabilose', has been produced, which can be dissolved in water and sprayed over the furrows and sandy lands with an ordinary sprayer to bind the surface of the soil. The surface is thus fixed and soil-blowing does not occur, whereas it does from adjacent untreated areas. A further advantage is that seed and fertiliser are retained and are not carried away and buried.

Extensive tests of the new material have been carried out by the Agricultural Research Institute at Groningen on the asparagus fields of Northern Limburg with the following advantages: The beds remain intact much longer; the asparagus is of better quality; harvesting is easier; soil erosion and the public nuisance caused by wind-blown sand is obviated.

There have also been extensive tests in the world-famous bulb fields and it is obvious that there will be other applications, such as the establishment of grasses on slopes and the establishment of strips of vegetation to serve as wind-breaks in extensive wind-blown areas.

The new product (for which a patent has been applied for) has a starch base and is applied at the rate of between 45 and 50 lb. per acre, according to the nature of the soil and the wind conditions.

The Creeping Menace

A new systemic weedkiller, known as 'Dowpon', the sodium salt of 2,2-dichloro propionic acid, will, it is claimed, cheaply and easily solve the creeping menace of couch grass. It is also said to be effective against lallang or illuk and other chemically-resistant grasses in the tropics.

This, the first product to be manufactured and marketed by a new chemical manufacturing company, *Dow Agrochemicals Ltd.*, recently established in Britain, has been selected because of its wide coverage in weed control, for not only will it control couch and other perennial grasses and annual grasses, such as black grass, meadow grass and wild oats, but it also appears to be an effective killer of bracken.

In cereal crops and leys a bad couch infestation can reduce production by from 50% to 70% and this infestation is progressive because it unfortunately thrives as a consequence of mechanised farming. It is responsible for the large acreage of bare and unproductive fallow, which is of the order of 300,000 acres per annum.

If this weedkiller is sprayed on the stubble, after the crop has been harvested, it effects control without any need for cultivation, harrowing and drying out of the underground stems over several months and the long period of bare fallow is quite unnecessary. A simple and inexpensive barrier spray of the hedge bottoms around the field will then keep them couch-free.

Multi-purpose Product

'Carco-X' is a multi-purpose formulation which it is claimed by the manufacturers, *Getzum Products*, of U.S.A., will deal with some 30 pests of the orchard and garden. It can also be used for destroying toadstools and fairy rings on lawns and for the removal of moss; for coating the weeping wounds of cut trees; for repelling moles by pouring large quantities of the solution into their runways; for spraying chicken houses to control chicken mite; for the control of root rots in flowering plants; for spraying roses against mildew; for the treatment of the soil against wireworms; as a general clean-up spray for greenhouses; for coating wood to give protection against termites; and a host of other protective uses.

It will repel certain vermin and insects; it will kill others on contact;

A low-volume sprayer, equipped with a hand lance, being used to apply a border spray of 'Dowpon' to prevent couch grass from creeping into the field from the hedge

while in other cases it acts as a stomach poison. It also serves as a fungicide. All this is because of the combination of chemicals used in its formulation: neutral coal tar oil, 60%; tar acids, 8%; gamma isomer of hexachlorocyclohexane, 0.5%; and other isomers, 0.9%. It mixes best with warm water, giving a milky solution. In spite of its many uses, it is not harmful to humans or to other warm-blooded animals, if used according to directions.

African Pyrethrum

Pyrethrum powder has been known as an insecticide for about 1,900 years and has thus stood the test of time. It is produced from a daisy-like flower, which is grown on the high plateaux of East Africa and the Belgian Congo.

The centre of this flower contains four insecticidal constituents, known as the pyrethrins, which can be extracted and used as a concentrate for the production of various formulations.

In its modern form, *P.Y.R.*, it has been improved by the introduction of synergists; these are chemical substances which, when added to the pyrethrins, increase the toxic action of the mixture to a greater degree than the sum of the toxicity of the individual components used separately. The synergists used are piperonyl butoxide and bucarpolate.

It produces, as a first effect, an almost instantaneous paralysis when brought in contact with insects – an effect known as 'knock-down'; it is deadly to a wide variety of insects; it can be used for house fly control and for the destruction of mosquitoes. It can be used safely, for no poisonous deposit is accumulated, and food, even exposed, suffers no taint or off-flavour.

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Insecticide and Acaricide

'Trithion' is an insecticide-acaricide made by the *Stauffer Chemical Co.*, of U.S.A., and tested under the code designation – Compound R-1303. It is a light amber-coloured liquid, which is miscible with most organic solvents, including n-hexane, xylene and the common alcohols, ketones and esters, and it is thus well adapted to be used as an additive to kerosene and the mineral oils that are commonly used in pesticide sprays. Its chemical name is 0,0-diethyl S-p-chlorophenyl-thiomethyl phosphorodithionate, and it is now produced in commercial quantities.

It is a non-systemic compound having comparatively long residual effectiveness, which it is claimed is effective against a large number of insect and mite species. It is stated to be highly active against the eggs and the post-embryonic forms of certain species, such as the European Red Mite, *Metatetranychus ulmi*, and the Apple Aphid, *Aphis pomi*.

It is also claimed to be slightly less toxic than DDT to the honey bee, and considerably less so than parathion to insect parasites and predators. It is claimed to be less hazardous to apply than most phosphatic insecticides, and it did not affect the taste of the crop, or leave any residual odour on any of the crops tested.

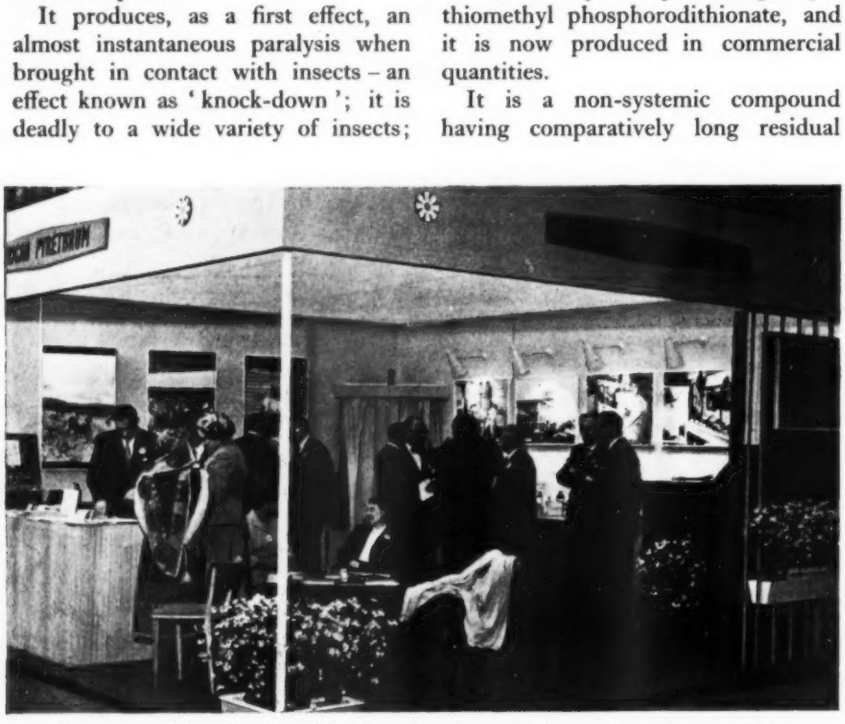
Against Seed Disease

'Fernasan A' is a standard dressing for peas, field beans, broad beans, brassicas, lettuce, cucumber, marrows, melons, spinach, sugar-beet, carrot, onions and maize. It not only prevents seed decay and plant disease, but it gives a more vigorous crop; trials have shown yield increases of up to 100% and more by using seed which has been dressed with this protective chemical, which is produced by *Plant Protection Ltd.* It is based on thiram, TMTD, and does not contain organo-mercurials.

Packaging

William Palfrey Ltd. are manufacturers of multi-wall paper sacks and their latest product, the 'NeverMold 101', is specially treated so as to be mould-resistant, and so is ideal for packing fertilisers, compost, peat moss, soil samples and for any purpose where water or moisture are involved. It is also used as the liner of the 3-ply 'Palfsack', which is used for packing seed potatoes, as the inner ply gives protection against the action of fungus with consequent defence against the inroad of pests, in particular the Potato Root Eelworm.

An entirely new method of sealing these paper sacks is provided by the *Thames Sack and Bag Co. Ltd.* The 'Stickla' is a high-speed, adhesive bag-sealing machine for use with bags of any size – up to 56 lb. The bag is closed and hermetically sealed and the contents are fully protected against deterioration. A concealed nylon cord which runs laterally through the length of every seal makes for easy opening.



Hundreds of health officers and food trade representatives visited the colourful stand of African Pyrethrum at the Crop Protection and Pest Control Exhibition organised by World Crops

World Crop Reports

Rice Harvest Down

INTERNATIONAL REPORT

Rice

World rice production in 1957–58 (August–July) is now estimated at 3% less than in 1956–57 and about the same as in 1955–56. The crop is estimated at 426,600 million lb. of rough rice, compared with the record harvest of 440,400 million lb. in 1956–57 and with 427,600 million lb. in 1955–56.

Despite a sharp setback from drought this season, production is 8% above the average from 1950–51 through 1954–55. World rice acreage, at approximately the record level of the year before, was 7% above average.

Thus, though bad weather caused world yields per acre in 1957–58 to be generally much below the good yields of 1956–57, they were above the average yields of 1950–51 through 1954–55. Good results from efforts of recent years to increase yields per acre are especially apparent in Asia and Africa.

Of the world's rice crop of 1957–58, 92% was raised in Asia. China's crop is estimated at 35% of all production, and India's 20%.

Drought reduced all rice crops in the Far East except in China, Japan and Korea. According to official data from China, the record production there resulted from a moderate increase in acreage and better yields than in the preceding year. *Japan* had a bumper crop for the third year, and *South Korea* had another good year.

Drought in *India* caused a sharp reduction in output. Although acreage was slightly larger than in the year before, production declined about 11%. The north-eastern states were especially affected by the drought, while favourable weather permitted southern states to harvest good crops. Though *Pakistan's* acreage was larger than in 1956–57, drought in East Pakistan and floods in West Pakistan caused a 6% decrease in production. *Indonesia's* crop also was smaller than in the year before.

Lack of rain in the exporting countries of *Burma* and *Thailand* caused a decline both in acreage and in yields per acre harvested. Current estimates of the rice crops are 17% and 15%, respectively, below the preceding year. Total production of the two countries is estimated at 28,500 million lb. of rough rice, compared with 34,000 million lb. in 1956–57. Drought also reduced crops in areas of *Indo-China* that usually have some rice for export. The decline in South Vietnam's crop was around 780 million lb. of rough rice, and for Cambodia it was 970 million lb.

The *Philippine Republic* harvested about 5% less than that in the year before because of drought. *Taiwan* had a drought in the first part of 1958 in southern states, where upland rice is mainly grown. However, considering the total yields of the two annual crops, a near-record output was harvested.

Malaya had another record rice crop in 1957–58. The harvest, estimated at 1,762 million lb. of rough rice, turned out better than expected and slightly exceeded the 1,750-million lb. crop in 1956–57. Rice acreage in *Ceylon* was greatly reduced by December floods. However, unusually high yields resulted in a crop slightly above the preceding season's very small output, which was reduced by drought.

The rice harvest in Western Europe was about as large as in the year before. *Italy's* acreage and production were cut sharply. But the decline there was offset by acreage gains in *France*, *Spain* and *Greece*. Yields per acre were above average for these countries. *Portugal's* rice acreage decreased slightly, but production increased moderately. Though *Yugoslavia's* acreage was below that of recent years, record yields per acre resulted in a record crop.

Production in Africa continued the steady increase of recent years. Acreage was up 4% from the year before and was 12% above the 1950–51 through 1954–55 average. An increase of 20% in overall yields per acre from that period has resulted in a gain of as much as 34% in production. Though 1957–58 yields were below average in a few countries that had poor weather, most African countries have succeeded to some extent in increasing yields per acre. *Egypt* had a record crop. Both the acreage and harvest of the *Belgian Congo* declined from the year before, but were well above average.

North America's output in 1957–58 shows a further marked decline from the peak level of three years before. The decrease has been due mainly to a continued reduction in *U.S.* acreage, which in 1957 was 47% below the 1954 record and 35% less than in the 1950–54 average period. U.S. yields per acre have increased and production in 1957 was only 14% less than in the 1950–54 period.

On the other hand, both acreage and yields per acre in *Cuba* and *Mexico* – the North American countries ranking next in production – have increased significantly. Mexico increased acreage 32% from the 1950–54 average and higher yields per acre brought about a production gain of as much as 46%. Cuba's rice acreage and production during the same period increased 54% and 80%, respectively, over the 1950–54 average, even though the 'hoja blanca' disease caused a decrease in Cuba's acreage of 1957.

Rice acreage of the *Dominican Republic* was at the preceding year's level, but production was not quite so large. The country is planning to shift some of the land now in rice to other crops.

Drought in Central America reduced crops in all countries except *Honduras*. Since 1954–55 lack of rain in that area has prevented good rice crops. Though acreage has gained steadily in these years, yields per acre have been lower, with the largest decrease in 1957–58. The most significant drop in production was in *Panama*, because of small yields, even though acreage increased substantially.

Lack of rain also greatly reduced output in the northern countries of South America. The crops of *British Guiana*, *Surinam* and *Venezuela* were 13%, 24% and 28%, respectively, below those of the preceding year. 'Hoja blanca' disease in Venezuela was a major factor in the decline there. Good rice harvests are about completed in the southern countries of South America. *Argentine* acreage increased

and yields were well above average. Larger production in *Chile* and *Uruguay* was from high yields per acre on acreages about the same as in the preceding year. *Southern Brazil* had a good rice harvest, particularly in the State of Rio Grande do Sul. Drought damage in the north-eastern states has not been finally determined, so that an estimated decrease of 8% in production for all Brazil for 1957–58 is only tentative. In São Paulo, a large producing state, the crop is well below that of 1956–57.

In *Australia* unusually heavy yields, currently estimated at 5,625 lb. of rough rice per acre, have resulted in a crop much larger than the previous record harvest of two years before. The acreage was only 40,000 acres, compared with 55,000 acres in 1956–57. Production in the new rice areas was set back because of floods, but it is still planned to grow rice in these areas.

REGIONAL REPORTS

Poland

Preliminary reports on this year's *sugar-beet* harvest in Poland suggest that yields will be good. Favourable climatic conditions have permitted earlier commencement of harvesting and average yields are expected to be in the region of 215 quintals per ha., which should allow the industry to fulfil its target of 1,060,000 tons of sugar quite comfortably. Full working at the 76 refineries in the country should be reached early in October and production from this year's crop should be completed by Christmas.

Tests on sugar content and weight early in September showed that the average sugar content was 14.79%, compared with 14.65% at the same time last year, and that average weight of the roots was 312 g., compared with 324 g. The area under sugar-beet this year is some 17,000 ha. larger than last.

Belgian Congo

Cotton production in the Belgian Congo, including Ruanda-Urundi, is now estimated at 220,000 bales (500 lb. gross) in 1957–58. By comparison, 230,000 bales were produced in 1956–57, and 246,000 bales in 1955–56.

Weather was unfavourable during the latter part of the growing season in the northern provinces and during the harvest in some areas. The estimated area planted to cotton this year was 850,000 acres, about the same as in the two previous seasons.

England and Wales

Severe thunderstorms at the beginning of the month caused some flooding and widespread waterlogging in Southern and Eastern England. Except for a dry sunny spell in mid-month, heavy rain fell on all parts of the country during the remainder of the month. In consequence the harvesting of cereal crops was hindered in most areas.

About 87% of the *cereal* crops had been harvested by the end of September. Only a small proportion of the total acreage is likely to be abandoned, but estimates of yields per acre of cereals were lower than the average of the previous five years. The yield per acre of maincrop and second early *potatoes* was expected to be below average, as blight was affecting tubers in a varying degree. The position for individual farmers in some areas where weather conditions have been particularly bad has, of course, been severely affected. Other root crops made good growth on the whole and, except for mangolds, yields per acre are expected to be about average.

Beans for stockfeeding. Many crops were badly lodged and some ' chocolate spot ' and aphid damage was reported. In some areas harvesting is complete; the quality and condition of the crops varied. Losses of *peas for stockfeeding* have been heavy and the general harvested condition is poor. The lifting of second early and maincrop *potatoes* has begun in almost all areas. In most areas the haulms were seriously affected by blight; the damage had extended in varying degrees to the tubers. Some slug damage was reported.

The lifting of *sugar-beet* had begun in several counties. Virus yellows disease was reported from some areas and bolters were prevalent in many districts. Crops were fairly good on light soils, but below average on heavy lands; the yield per acre of roots is expected to be about average. On the whole, *mangolds* had made good growth during the month and the crop was fairly satisfactory. There were some reports of virus yellows. The yield is estimated to be 22 tons per acre, as compared with a five-year average of 23.3 tons and a yield of 23.4 tons in 1957. *Turnips and swedes* were generally satisfactory and those attacked by diamond-back moth were recovering. The yield of turnips and swedes is forecast at 16 tons per acre, as compared with a five-year average of 15.9 tons and a yield of 17 tons in 1957. *Kale* made good growth, except where checked by weeds. Weeds are prevalent in all root crops.

Special report

In spite of the wet summer, many more *wheat bulb fly* eggs have been laid this year in the East Midlands area, including Lincolnshire, and in East Anglia than for some time. Dangerously high numbers have been found on a high proportion of fields which have been bare fallowed or where early potatoes or vining peas have been grown.

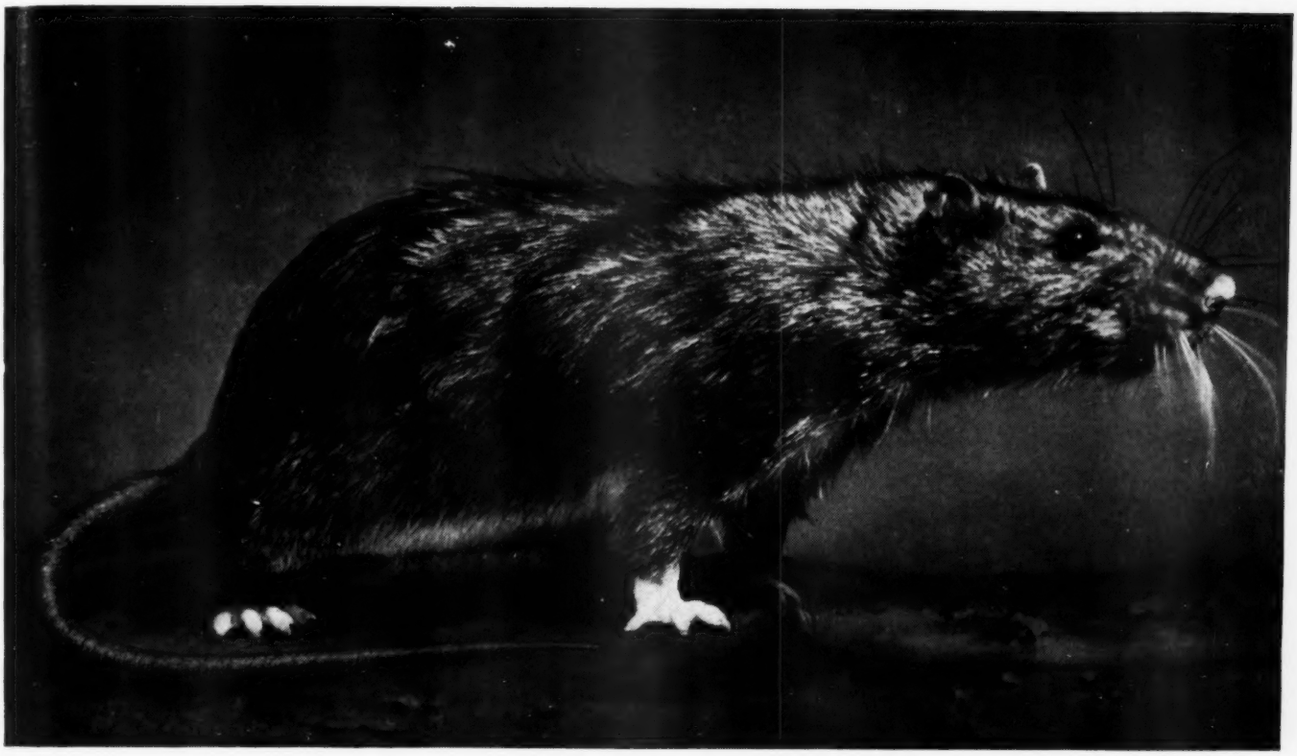
In areas where this pest is often troublesome farmers who intend to sow winter wheat on such fields are advised to take precautions to reduce the risk of damage. Fields sown in good time, say, up to the end of October, rarely suffer serious loss.

Although no form of chemical control is always completely effective, there are several materials which give some protection, particularly on later sown crops. Seed dressings containing at least 40% gamma-BHC, dieldrin or aldrin, in addition to the usual organomercurial fungicides, and applied at 2 oz./bushel are the cheapest and usually the most effective methods. The germination of grain containing over 16% moisture may be affected by seed dressings, particularly those containing gamma-BHC. This material is, however, the most effective seed dressing on crops sown very late, *e.g.* after mid-December. Deep drilling should be avoided, as it not only delays germination, but there is some evidence that it reduces the effectiveness of the seed dressings.

Combine drilling of aldrinated fertiliser so that at least 1 lb. of actual aldrin is applied per acre can also give a useful control and may be particularly valuable where the seed has already been dressed with organomercury only, or with the lower percentage wireworm dressing.

Acknowledgement is made to *Fo. Crops & Mark.* and to *Spec. Reg. Inform Services* for much of the information cont ned in the above reports.

THE CRIMINAL



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Ratafin kills by causing internal bleeding. The action of Ratafin is painless, but also deadly, thanks to the remarkable killing power of Fumarin. Rats do not develop bait shyness to Ratafin, because they never suspect the presence of the killer—a drawback to so many rodenticides.

Mix Ratafin with the material the rats are currently feeding on; then confidently wait for them to die. It usually takes from 5 to 14 days. In a few weeks, entire rat populations can be controlled with this anticoagulant rodenticide.

Now, in addition to the dry form, Ratafin is also available as a water-soluble material, "Ratafin S." Where very severe problems exist, maximum control can be achieved by offering both dry and soluble Ratafin in the food and drink. This combination is especially effective under dry conditions, when the rodents seek out water.

Ratafin is economical, too. A pound of the dry bait is capable of destroying large numbers of rats, both brown and black. It is also safe. In the amounts used to kill rats, it presents minimum hazard to human beings or domesticated animals.

Ratafin is ideal not only in croplands, but also around warehouses, in sewers, waterfront buildings, ships—wherever, in fact, rats are a problem.

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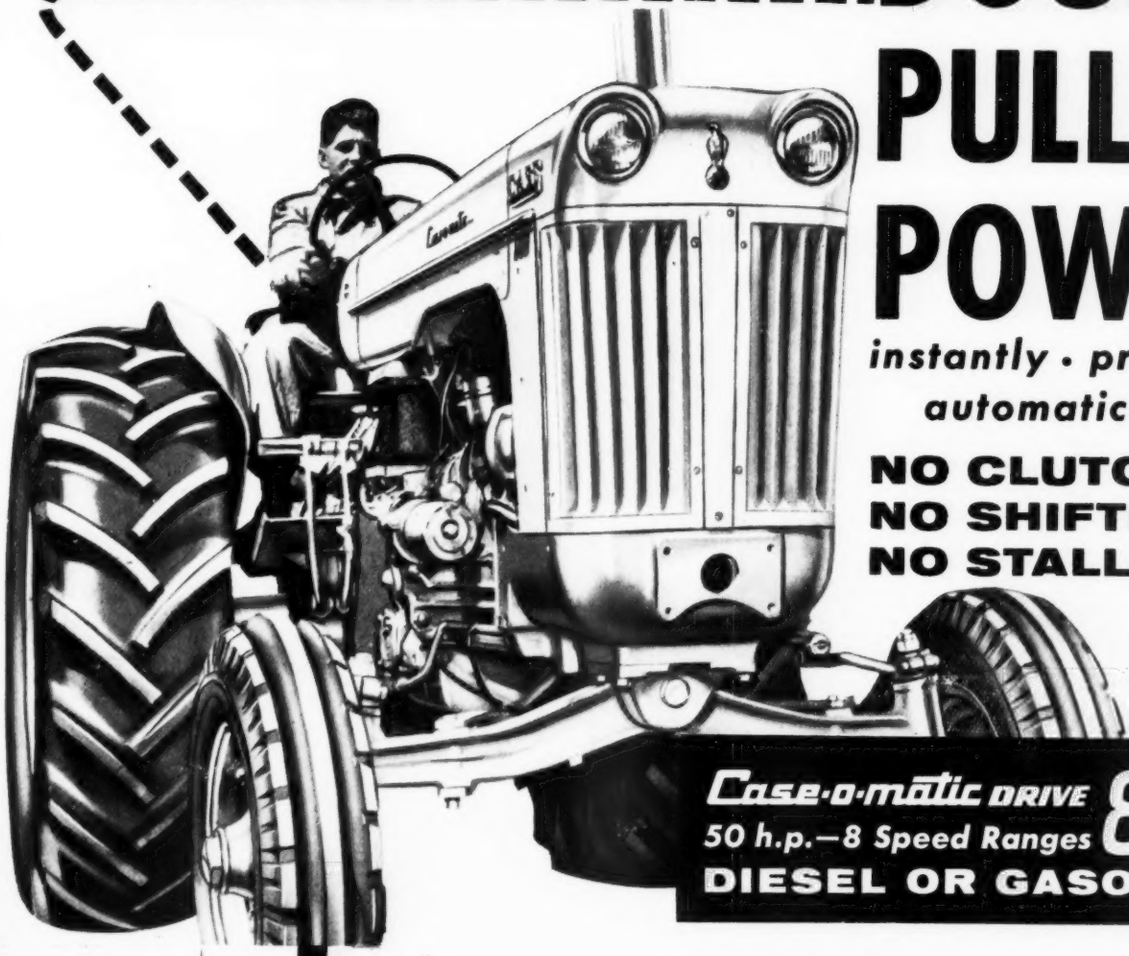

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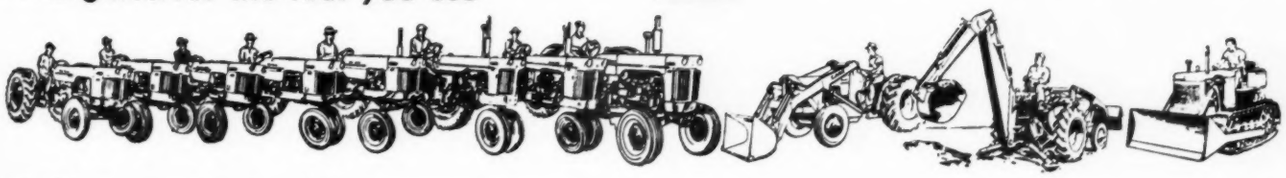

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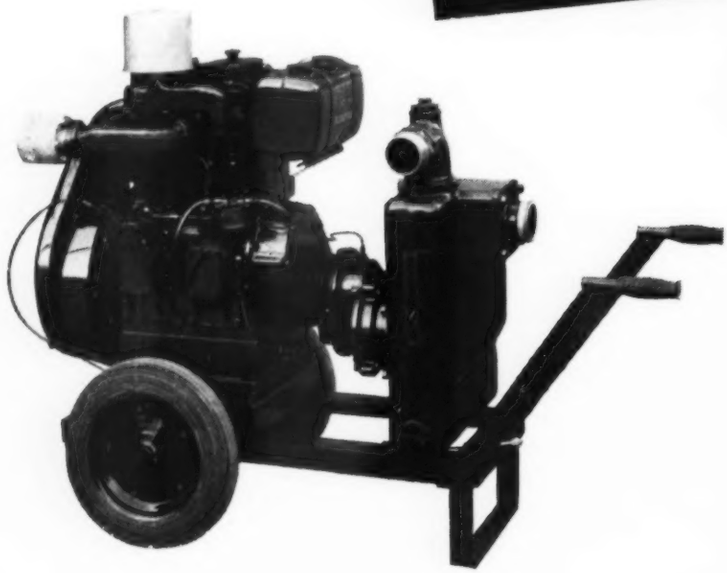

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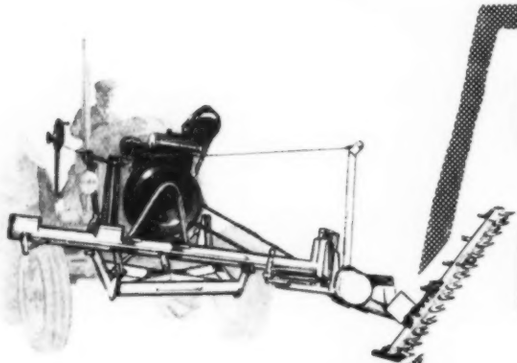

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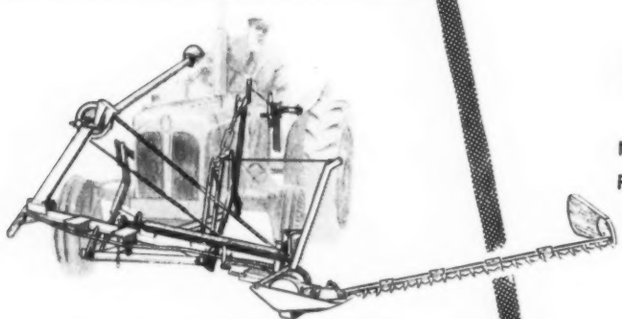

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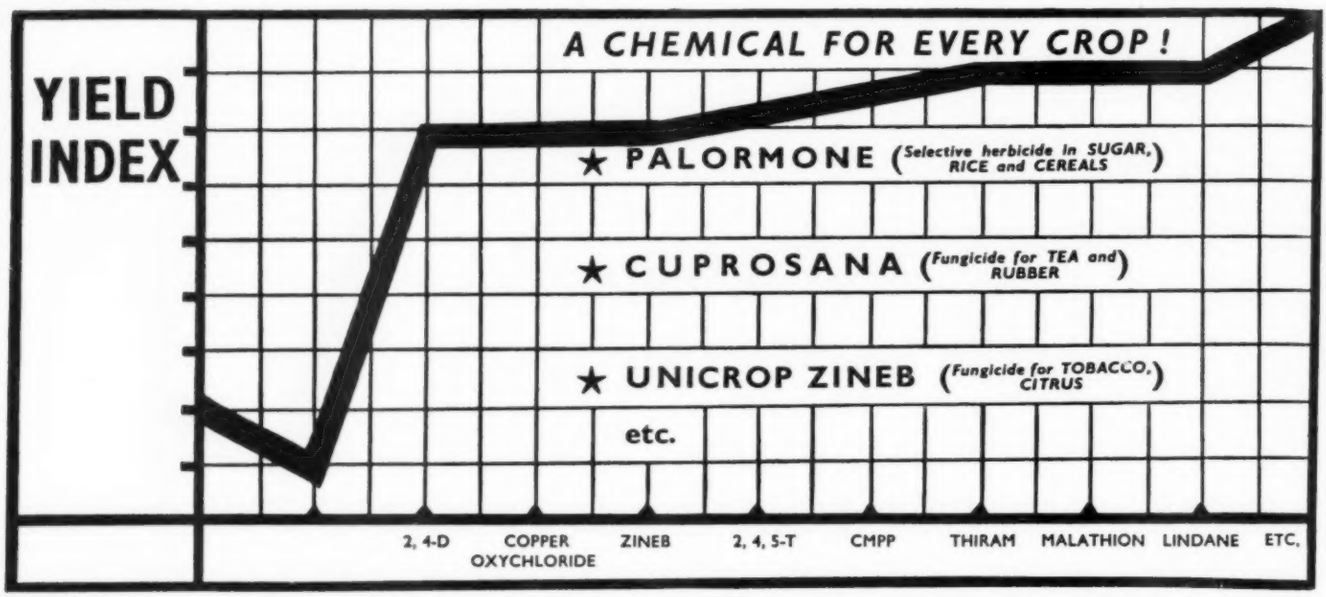

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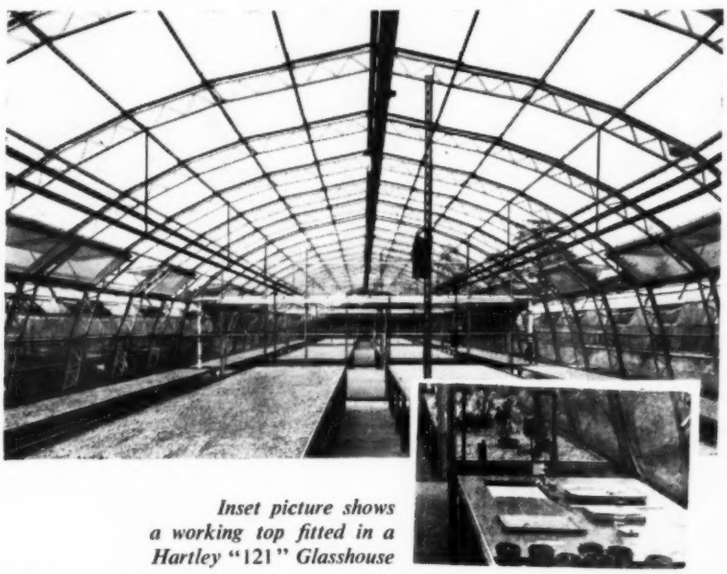

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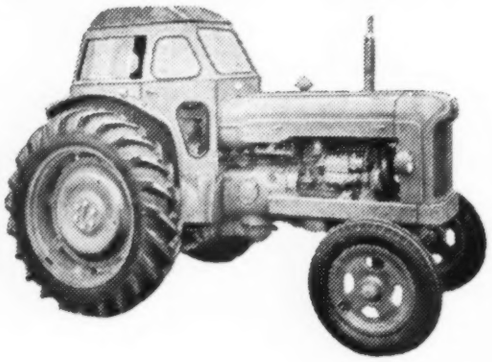

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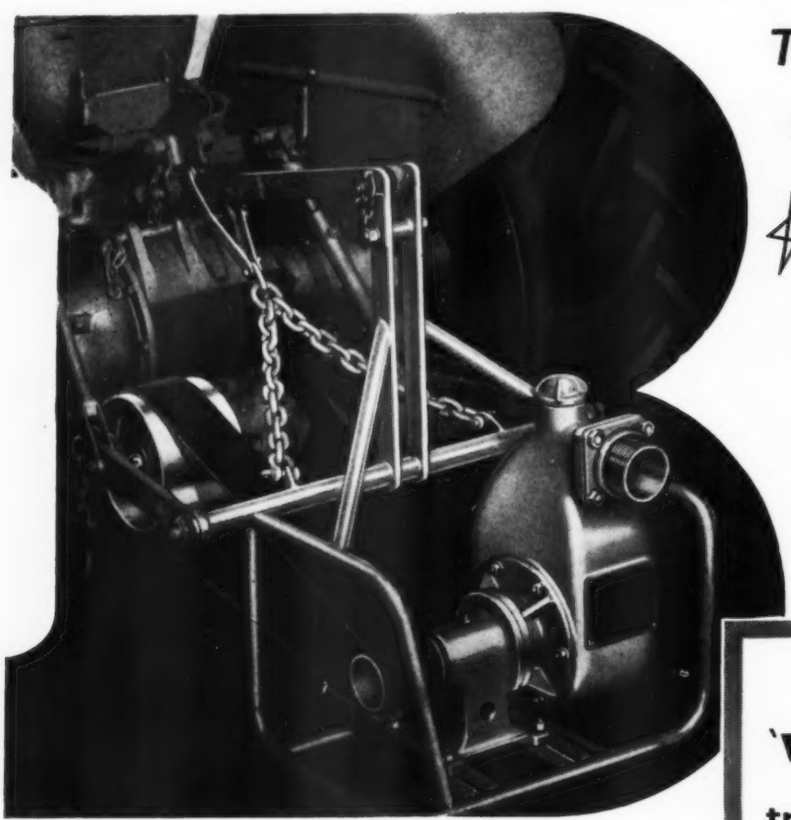

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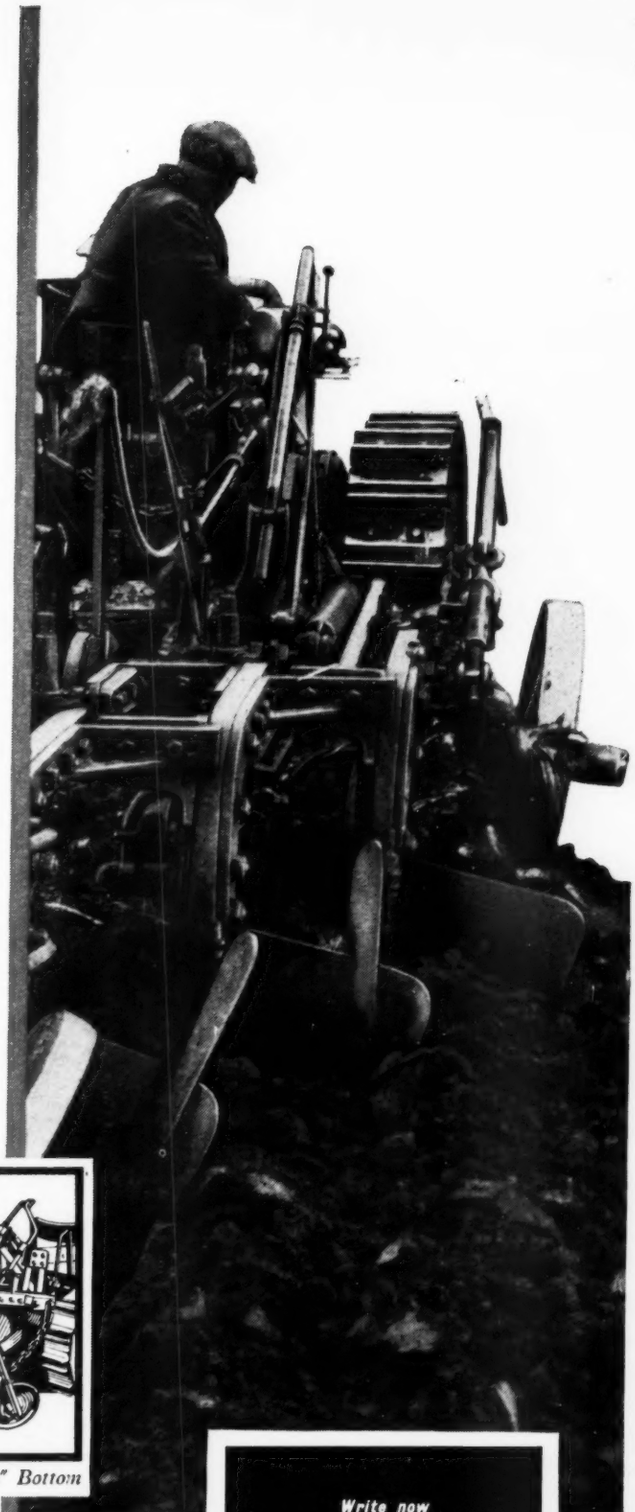

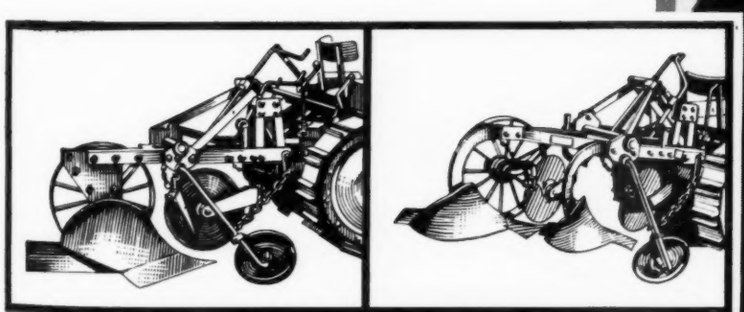

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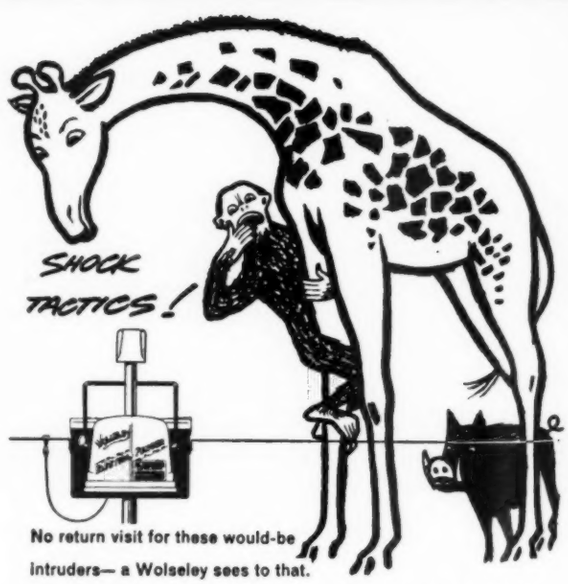

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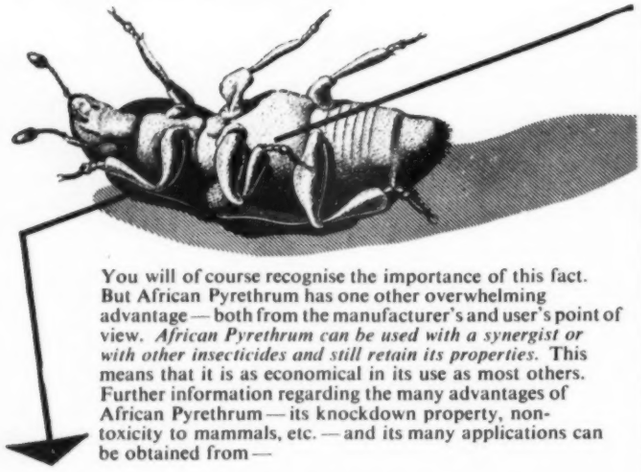

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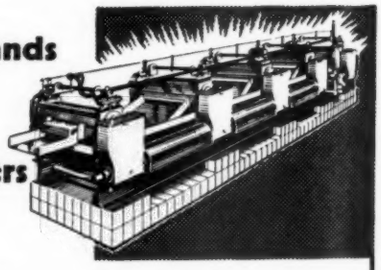

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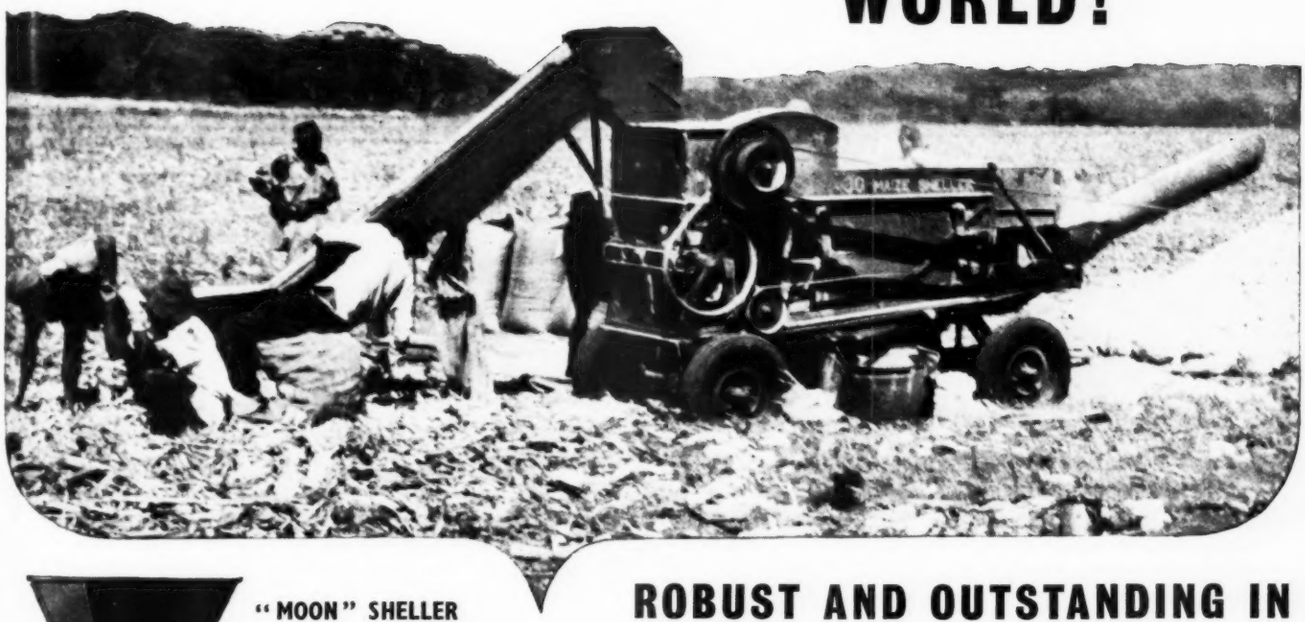

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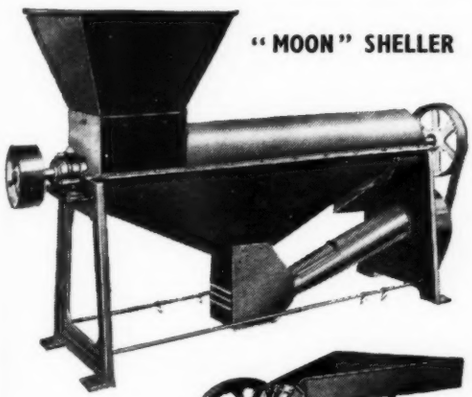

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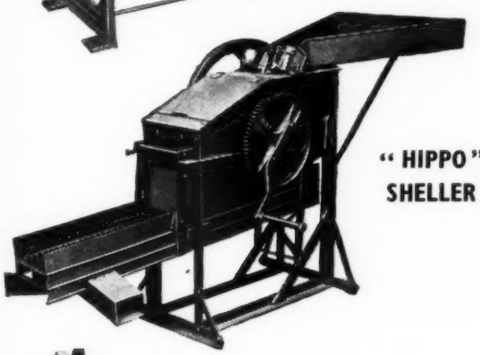

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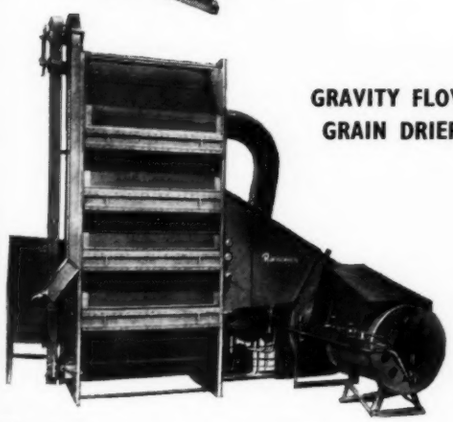

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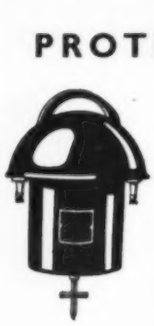

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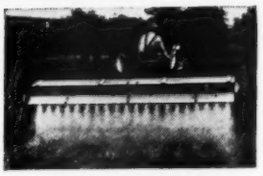

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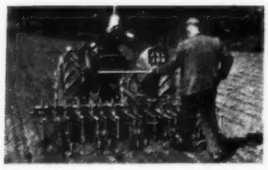

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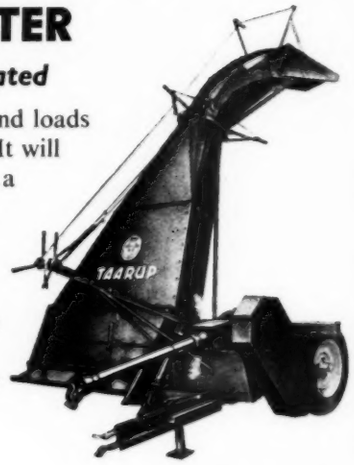

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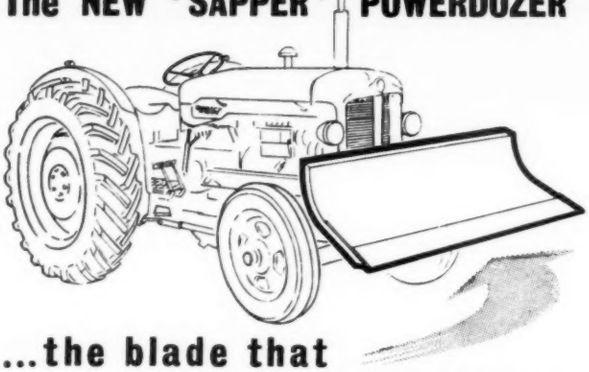

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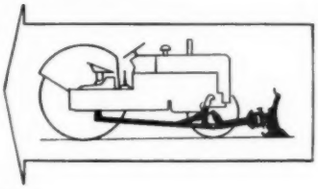

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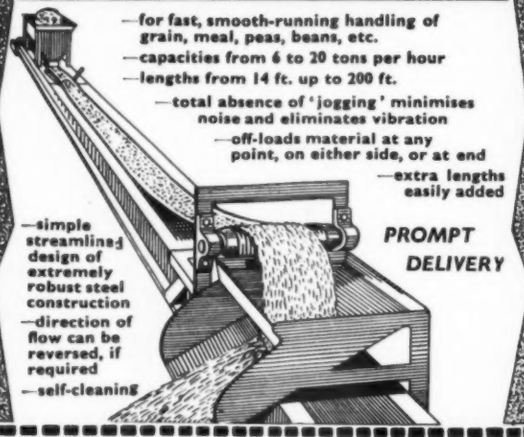

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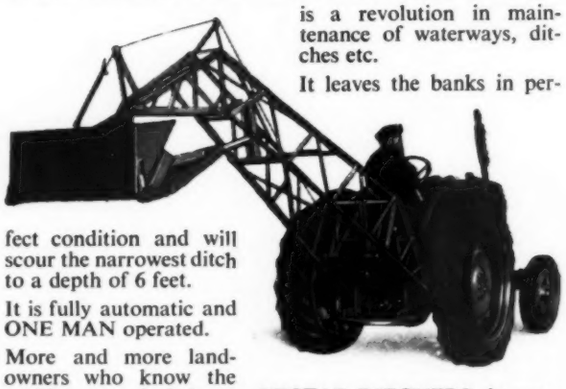

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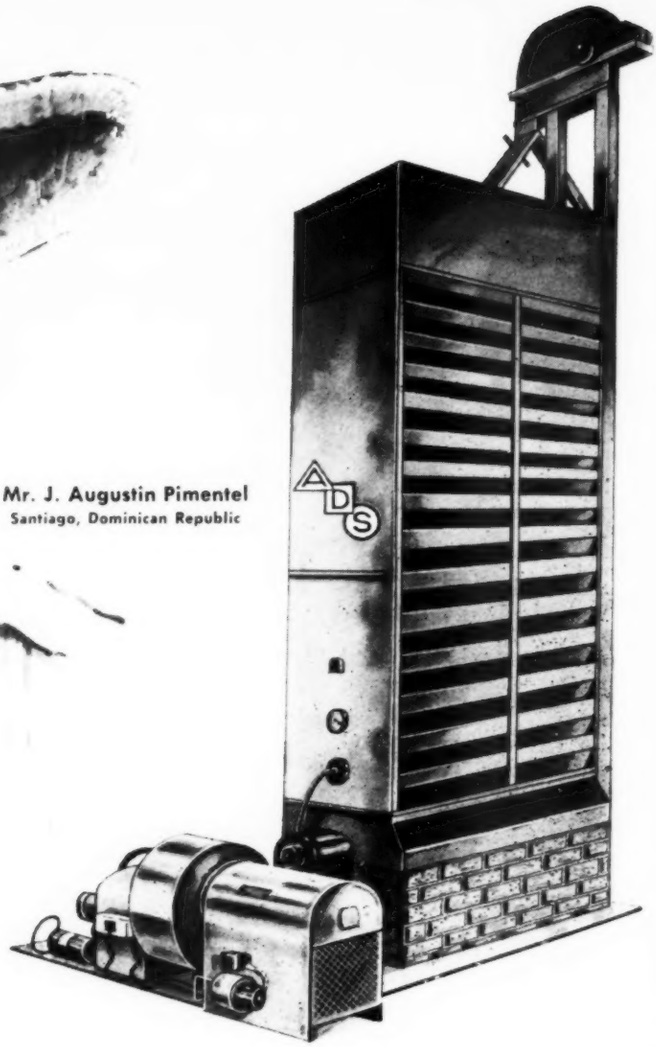

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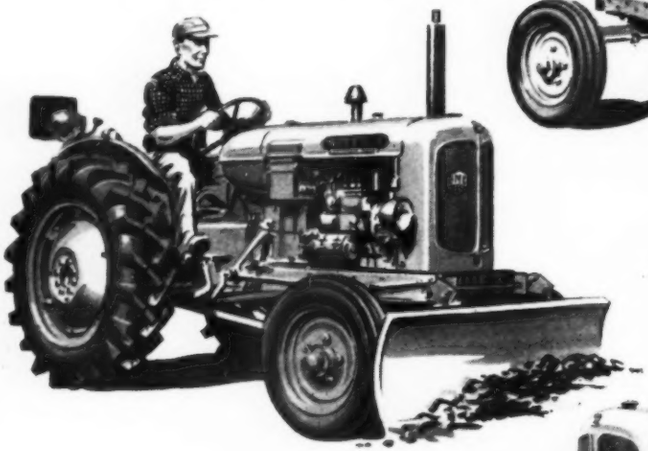

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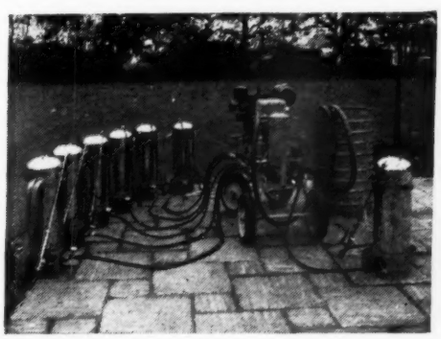

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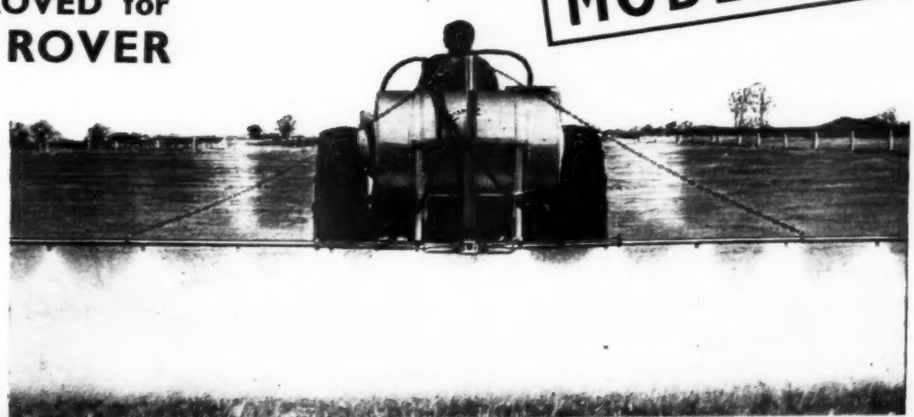

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The annual general meeting of Harrisons & Crosfield Ltd. will be on 9 December in London.

The following are extracts from the circulated statement by the chairman, Sir Leonard Paton, for the year to 30 June, 1958:

The Group profits for the year, after charging £648,825 for taxation, amounted to £539,912. Adding the amount brought forward from last year, £477,344, makes the balance available £1,017,256, which it is proposed to appropriate as follows: General Reserve £332,812, dividends of the parent company (less tax) paid and proposed £231,610, totalling £564,422, and leaving to be carried forward £452,834.

The directors recommend a final dividend of 10% on the Deferred Ordinary Stock, repeating last year's total of 15% for the year. In addition, the directors recommend the payment of a special Jubilee bonus of 2½% on the Deferred Ordinary Stock to mark the fiftieth year since the company was incorporated.

Further to commemorate the occasion the directors have formed a fund, to be named the Miller-Peake Jubilee Fund, and have transferred to it the sum of £37,500, which is the equivalent of the Jubilee bonus. The fund will be used at the Board's discretion for the benefit of the staff throughout the Group.

Although profits after tax are a little short of the previous year, the Group trading profit shows quite a substantial fall. Our growing activities outside the East yielded increased profits, but the increase was inadequate to compensate for the less favourable results in Eastern territories.

Taxation on profits in India and Ceylon is higher than in the U.K. and, owing to duties, levies and cesses, true total taxation on producers is higher still.

The business remains highly liquid. Net current assets at 30 June were £6,382,000. Reserves and undistributed profits totalled £4,654,000.

TEA. Unless there is some major upset, it appears unlikely that any marked change may be anticipated from the average price levels which have ruled during the past year, a prospect far from reassuring to many plantation companies in India and Ceylon.

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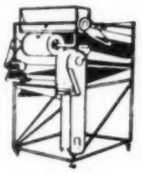

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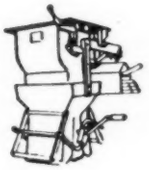

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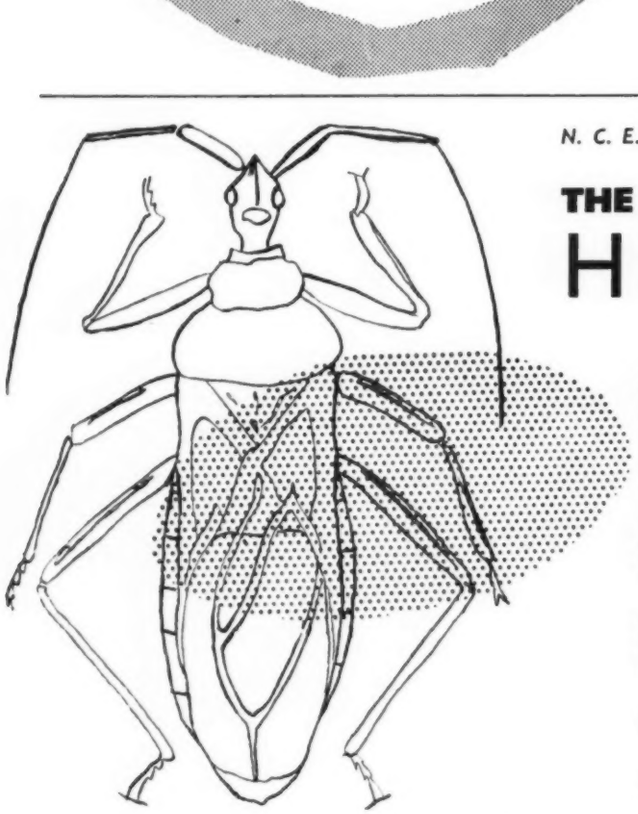

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Taxonomic literature is vast in extent and is scattered in innumerable publications printed in several European languages. The position as regards the biology of the Heteroptera is similar, although the literature dealing with them is not nearly as extensive.

Since it is not always practicable for the entomologist working in the field to have access to publications containing studies on the biology of the Heteroptera, or indeed, of most other insects, the present work in which, so far as possible, all available information on the subject supported by an extensive bibliography has been collated should prove of considerable value.

Among the chapters into which the work is divided, apart from those containing a general account of the biology, are some in which the association of Heteroptera with man and other mammals is discussed; others describing their natural enemies and also certain aspects of their development and morphology. Much of the information under these headings is based on the writer's first-hand observations.

The value of the book is greatly enhanced by the addition of a list of the family and subfamily names with their synonyms. Such a list, it is believed, will do much to bring uniformity in the use of these names, which unfortunately is rather lacking at present.

To assist identification, representative members of all the families (and in certain cases of the subfamilies) are illustrated photographically, except when photography is not a suitable medium; in such cases line drawings, most of which are original, are provided.

Contents : List of Plates. Introduction. Part 1—General Account of the Heteroptera. Family and Subfamily Names of Heteroptera. Development. The Legs of Heteroptera. Stridulation. Natural Enemies of Heteroptera. Heteroptera associated with Mammals and Birds. Part 2—Families of the Heteroptera. References. Index.

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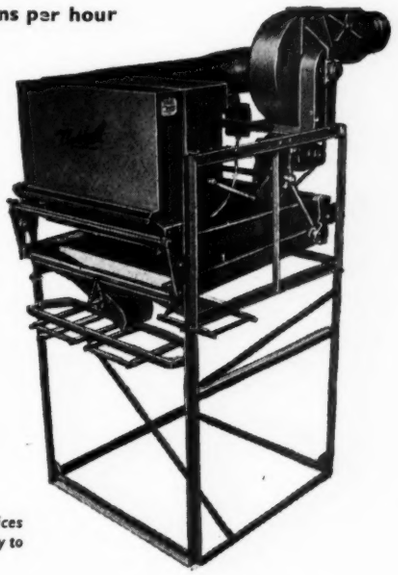

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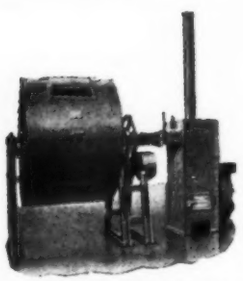

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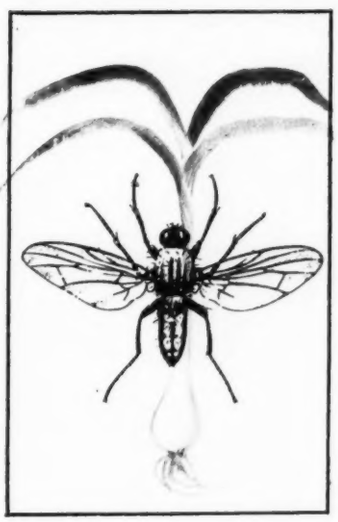

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